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ANNALS of SURGERY

VOL. LXXVIII JULY, 1923 No. 1

FATAL ANAPHYLAXIS FOLLOWING BLOOD TRANSFUSION*

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AND

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BLOOD transfusion in recent years has assumed such a position among the therapeutic measures of the medical profession and at the present time is being so widely employed in the treatment of such a variety of conditions, that any light thrown upon its effects—good or bad—may be regarded as worth while.

The reactions following transfusion have been of varied type and the reports of their frequency have shown as much variation. Whether reactions are more frequent and more severe after the use of the citrate method than they are after other methods of whole blood transfusions is still under discussion. Certain it is that reactions have occurred after all methods that are in general use at the present time. These reactions have varied from a passing feeling of chilliness, through headache, malaise, fever, chills, urticaria, hæmolysis with hæmoglobinuria, acute anaphylactic shock, acute anuria, delirium, to death.

Ravidin and Glenn report one hundred thirty-eight citrate transfusions and forty-seven Kimpton tube transfusions with the same percentage of chills. They had one death by each method. Sloan reports four hundred thirty-six Kimpton tube transfusions at the Lakeside Hospital with temperature reactions of one degree Centigrade in five per cent. of the cases. Kimpton has had five hundred transfusions since 1912-13 with two deaths. Bernheim has had two deaths following transfusion with matched blood by the citrate method, and one death following transfusion by the same method when unmatched blood was used. He says that he knows of four unreported deaths that followed transfusions done by the citrate method. He is authority for the statement that reactions follow 20 to 40 per cent. of transfusions done by the citrate method but that they follow only about 5 per cent. of those performed by the ordinary methods of whole blood transfusion.

Explanations of the reactions following transfusions are unsatisfactory. No one can even consistently predict when there will be a reaction and when there will be none. From the accumulating evidence, however, there are some suggestions that are worth noting.

* Read before the Philadelphia Academy of Surgery, January 8, 1923.

I. Too rapid introduction of the blood may embarrass the circulation.

II. Ramirez has reported a case of horse asthma following blood transfusion. A donor, who was sensitive to horse dandruff, gave six hundred cubic centimetres of blood. The recipient, who had not previously been sensitive, developed a typical acute asthmatic attack upon exposure to horses two weeks after the transfusion. He had a similar attack one day later. Another patient transfused from the same donor, however, failed to show similar phenomena.

III. Some have thought that the cause of reaction is to be found in hypothetical changes that take place in the protein of the blood upon exposure to air.

IV. Burman of the Mayo Clinic has called attention to the rôle that new rubber tubing made by one industrial concern may play in the reaction. This reaction can be guarded against by soaking the new tubing six hours in normal sodium hydroxide solution.

V. Incompatibility between the blood of the donor and that of the recipient was a frequent cause of severe reaction before the days of blood grouping. Even when the tests have been made it may still happen that through the inexperience of the operator or the staleness of the sera used in making the tests, an incompatible group may appear to be compatible. The symptoms following a fatal transfusion with incompatible blood may be described in the words of Peterson: "The clinical picture of these reactions is typical. They occur early, after the introduction of fifty or one hundred cubic centimetres of the blood; the patient first complains of tingling pains shooting over the body, a fullness in the head, an oppressive feeling about the precordium, and, later, excruciating pain localized in the lumbar region. Slowly but perceptibly the face becomes suffused a dark red to a cyanotic hue; respirations become somewhat labored, and the pulse rate, at first slow, sometimes suddenly drops as many as twenty to thirty beats a minute. The patient may lose consciousness a few minutes. In one-half of our cases an urticarial eruption, generalized over the body, or limited to the face, appeared with these symptoms. Later the pulse may become very rapid or thready; the skin becomes cold and clammy, and the patient's condition is indeed grave. In from fifteen minutes to an hour a chill occurs, followed by a high fever, a temperature of 103 to 105, and the patient may become delirious. Jaundice may occur later. The macroscopic appearance of hæmoglobinuria is almost constant."

In another case reported (Bernheim), the functions of the kidneys became so interfered with by deposits of hæmoglobin or red blood-cells that the patient died with suppression of urine and all the signs of uræmia.

Reactions in this group of cases vary at least partly according as: (1) The donor's corpuscles are hæmolysed by the recipient's serum; (2) The recipient's corpuscles are hæmolysed by the donor's serum; (3) The corpuscles of each are hæmolysed by the serum of the other. Hæmolysis is stated

to be preceded always by agglutination, however, and it seems that agglutination may be the more rapidly fatal of the two.

VI. Serious reactions sometimes occur after repeated transfusions in patients suffering with primary anæmia. Bowcock has reported several such cases. In one case the reaction occurred after 175 cc. of citrated blood had been introduced (this was the fifteenth transfusion for the patient). Respirations became sighing and the patient was slightly dyspnœic, shaking but not chilly. Temperature 104.6. Vomited. The patient became irrational and remained so for more than a week. During that time urinary and fecal incontinence alternated with urinary retention. The urine was orange colored and contained red blood-cells and hæmoglobin.

This reaction is rather suggestive, as we have seen, of the type of reaction following transfusion with blood of an improper type. Some weight is lent to this view by the fact that when the blood of the donor and recipient were rematched for the second time the donor's serum against the recipient's cells gave a very slight hæmolysis. In this connection it may be of interest to note that McClure and Dunn have shown that a donor may be compatible for one transfusion but be incompatible for a subsequent one, and this can be demonstrated by blood matching.

VII. The citrate method has an equal part with the other methods in the ills described above, and in addition has its own individual troubles. Lewisohn, however, after a long series of parallel cases thinks the results from the citrate method are as good as any. Drinker thinks that there are a few, and only a few more reactions after the citrate method. Lewisohn has shown that five grams of sodium citrate in solution can be given man intravenously without a toxic reaction. We are not informed, however, as to whether any of this work was done on patients suffering with a blood dyscrasia. Keynes, while using the citrate method, states that he has seen one reaction from citrate solution given intravenously in small amount. Speaking of the reaction following the injection of citrated blood he says: "The symptoms of this reaction are a slight headache, a rise in temperature to two or three degrees above the normal, sometimes accompanied by a rigor or sensation of chill, and an increase in the pulse rate. The effect is, however, always very transitory, lasting only two or three hours, and is never, in my own experience, attended by any symptoms that need give rise to anxiety for the patient's welfare; nor does it in any way prejudice the therapeutic results of the transfusion." The belief in many quarters of the United States is certainly at variance with the above view as applied to markedly anæmic patients suffering with one of the blood dyscrasias.

Drinker and Brittingham think that the reactions following transfusions with citrated blood are due to: (1) Incompatibilities not detected in vitro. (2) Platelet changes in the process of coagulation. (3) The action of the citrate solution on the red cells increasing their fragility and promoting hæmolysis.

CASE REPORT

Mr. J. C., age seventy-five, white. Referred by Doctor Cloud to Dr. W. E. Lee for transfusion. Admitted to Bryn Mawr Hospital, July 24, 1922. Complaint: Weakness. Tires easily. Family History: Not pertinent to the present illness. Past History: Patient has had measles, mumps, chicken-pox, scarlet fever, diphtheria, whooping cough. He has an occasional sore throat. He had a Neisserian infection as a young man. Jaundiced once twenty-five years ago. Hemorrhoidectomy many years ago. Uses alcohol and tobacco moderately. Present Illness: Six weeks before admission, patient noticed that he tired more easily than formerly. He felt that he was distinctly weaker. He became conscious about that time of his heart palpitating. Appetite remains good. He sleeps well. His bowels move regularly. He has lost twenty-five pounds during the last three months. Review of systems is essentially negative.

Physical Examination.—The patient is a slightly undernourished white male of about seventy-five years. He does not appear to be in any pain or distress. The skin is pale and rather lemon yellow in color. The mucous membranes are pale. There is no local or general glandular enlargement of note. Arteries are in good condition. Pulse is regular and of fair volume. Blood pressure 130/65. The lungs are clear to percussion and auscultation. Heart not enlarged, sounds well heard. There is a slight blowing systolic murmur at the apex. This is not transmitted. It is probably an hæmic murmur. Abdomen, extremities, and reflexes are negative. Laboratory: Wassermann negative. Urine negative. Phenolsulphonephthalein test, 50 per cent. in two hours. Blood examination on three different occasions showed practically the same findings: Red blood-cells, 1,400,000, hæmoglobin, 28 per cent., white blood-cells, 4,600. Remarks: Red cells of good color. Considerable anisocytosis and poikilocytosis. No nucleated red cells. Blood type: III (Moss).

The patient was transfused August 17, 1922, at 5:00 P.M. He was given 500 c.c. of blood in 55 c.c. of 2 per cent. sodium citrate solution. The citrate solution was made just before the operation with water that had been distilled that day. The donor was a man who appeared to be in good health, had a negative Wassermann, belonged to Type III of the blood groups, and had had his blood matched that day against the recipient's without any evidence of agglutination or hæmolysis. The transfusion was performed slowly through tubing previously used for intravenous therapy. During its performance the patient showed no evidence of distress, but on the contrary appeared to be in quite good condition. He continued to appear normal for about one hour, when he developed great respiratory difficulty. His breathing was distinctly asthmatic in type. He gasped for breath and there was a laryngeal stridor. Innumerable piping musical and a few moist râles could be heard throughout both sides of his chest. There was no increase in the area of cardiac dullness. Heart sounds were not noticeably affected. The patient was slightly cyanosed. He voided in the bed and had a bowel movement during the paroxysm. He was conscious. There was no paralysis. Brandy, adrenalin, atropine, benzyl-benzoate, and morphia were given. At ten o'clock he appeared better, but at midnight he had a rattling in the throat, moist râles throughout both lungs, and the symptoms of a pulmonary œdema. He became comatose a little later and died at three o'clock the next morning, ten hours after the performance of the transfusion. A specimen of venous blood taken a short time before death showed no clumping or hæmolysis of the red cells. The urine was clear and examinations for red blood-cells and hæmoglobin were negative.

In this case, we find a man with a primary anæmia developing the symptoms of acute anaphylactic shock following a first transfusion. The onset was with spasm of the smooth muscle in bronchioles, bladder and bowels; evidenced by respiratory difficulty, typical asthmatic râles, urinary and fecal incontinence. The spasm of smooth muscle was followed by a relaxation with which was associated a pulmonary œdema. The temperature rose to 102 and then returned to normal. Pulse and respirations rose and remained elevated, being around 130 and 36 respectively. The patient had a primary anæmia. So far as any evidence that we have goes the primary anæmia was at that time aplastic.

The selection of the citrate method in such a type of case will meet with serious questioning in many quarters. The giving of an initial transfusion of five hundred cubic centimetres will also be questioned. Neither of these, however, are sufficient to account for a lethal exodus. The blood of the donor was carefully typed and cross-agglutinated with that of the recipient. After the reaction had progressed for several hours the venous blood showed no evidence of agglutination or hæmolysis. The urine showed no evidence of hæmolysis. There was nothing to indicate an infarction in any locality. There was no history of asthma, hay fever or other type of protein sensitization in either the donor or the recipient. True anaphylaxis requires that there shall have been a preceding sensitization with a minimal dose of a similar foreign protein introduced into the circulation. Of such there scarcely seems a possibility here, yet the reaction following the transfusion—a reaction delayed for one hour—when it did develop was typically that of an acute anaphylaxis.

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PLEURAL EPILEPSY*

By Hubley R. Owen, M.D.
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From the earlier days of medical history when the clinical observations of a few brilliant minds were the only reliable bases of medical knowledge, to the present time with our well equipped laboratories managed by competent men, and with our post-mortem amphitheatres where death has given the solution to many of the enigmas of life, the problem of epilepsy remains practically unanswered. Medical literature contains many excellent articles on this subject. The disease has been carefully and systematically studied. Many divisions have been made grouping the cases according to their etiology or symptomatology. A number of cases were so placed under the name of "Reflex Epilepsies." In this connection the name of Brown-Sequard should be mentioned.[1] Even now his masterful work is consulted as avidly as it was many years ago. As a result of his studies the name of "Reflex Epilepsy" came into medical parlance, a very fortunate and logical term endeavoring to explain the etiology of the disease.

We are here concerned with the sub-group that Aubouin,[3] in 1878, first called "Pleural Epilepsy" (Epilepsie Pleuretique), an epileptiform manifestation occurring when the pleural membranes are stimulated by either physical or chemical agents.

Having observed such a case during the injection of Beck's paste (30 per cent. of bismuth subnitrate in vaseline) into a chronic empyema cavity preparatory to röntgenographic studies, we decided to review the literature on this subject in search of some plausible explanation of this curious phenomenon.

HISTORICAL

The first recorded case of convulsions complicating the treatment of empyema was reported in 1864 by Roger,[2] who presented to the Medical Society of Parisian Hospitals the case of a young girl, eight years of age, who had bronchopneumonia followed by empyema. Roger treated the empyema by thoracentesis and pleural lavage. Numerous injections of antiseptic solutions were used. During one of these injections the girl suddenly collapsed and soon after had an epileptiform seizure. The patient remained semiconscious for several hours, but completely recovered. Roger believed that the convulsive seizure was due to the injection of a large quantity of fluid rapidly, compressing the lung. It was not Roger's object to discuss pleural epilepsy. He only mentioned its occurrence as a passing remark on the case.

* Read before the Philadelphia Academy of Surgery, January 8, 1923.

A few years later (1875), Maurice Raynaud made an especial communication on the disease to the Society of Parisian Hospitals, reporting two personal observations of pleural epilepsy. The Paris clinicians evidently were awakened to its importance, for in the same year similar cases were reported by Lepine, Wallain and Brouardel.

In 1878, Aubouin, in presenting his graduating thesis to the University of Paris, reviewed the literature on the disease and for the first time called it: "Pleural Epilepsy."[3] Since then over fifty cases have been reported. The large majority of reported cases are to be found in the French Literature. Goodhard and Thompson, in England, and Von Dusch, in Germany, were early contributors. In this country no great attention has been paid to pleural epilepsy, for we have been able to find only the briefest literature on the subject.

DaCosta[4] mentions that syncope or convulsions may occur during paracentesis thoracis.

In 1892, Jeanselme published a very complete work on "The Nervous Accidents of Thoracentesis and Empyema." In this work he analyzes the facts concerning pleural epilepsy, and reports six cases observed by deCerenville, one by Letulle, and one by Hutinel. Other papers were written by Cestan, Camus, Roch and Cordier.

ETIOLOGY AND PATHOLOGY

When many causes are attributed to a disease, as in cancer, and not many years ago in syphilis, no one of these causes is usually satisfactory. One observer may lay great stress on one symptom, while the same symptom is of but little importance to another observer. The value of interpretation of a group of facts is a matter of personal equation, which may vary greatly. In "Pleural Epilepsy" many etiological factors have been brought into the foreground. Race and age have no bearing on the disease. Men are more frequently affected than women. This may be due to the fact that men suffer from empyema more frequently than women.

The exciting cause is the introduction into thoracic cavity of some foreign substance: Beck's paste, or an antiseptic solution, such as, carbolated water or Dakin's solution. In some cases reported the introduction of an aspiring needle caused an attack. In the majority of the cases the convulsion occurred during the therapeutic procedure. In a small number of cases the convulsions occurred after several hours or even days.

The necropsy studies of fifteen cases of pleural epilepsy throw no light on the subject. There were a few minor pathological changes which could not account for the disease.[5]

Endeavoring to explain the cause of this obscure condition, several theories have been advanced: (1) Toxic, (2) Mechanical, (3) Uremic, (4) Anaphylactic, (5) Embolic and (6) Reflex. Only the last three deserve a word of explanation.

Anaphylaxis is the latest theory as the etiological factor of pleural epilepsy. This theory, which originated at the time when many diseases were attributed to anaphylaxis, might prove useful in some cases, but we cannot conceive that the injection of bismuth paste or of sterile water could cause anaphylaxis. Bismuth has been used in many other conditions, such as tubercular sinuses, with no anaphylactic reaction. The injection of water as a cause of anaphylaxis seems out of the question; moreover, anaphylactic reaction cannot be explained by the introduction of an aspirating needle. It is difficult to properly explain those few cases in which the convulsion occurred several hours after the injection of an antiseptic fluid.

The embolic theory aims to interpret the convulsions with the supposition that small fragments of foreign matter are carried by the blood stream to the motor areas of the brain. These particles acting as emboli produce cerebral irritation and probably a small area of anemia. The system responds to the irritation by convulsions which may be either local or general. If the irritation is too great or the embolus too large paralysis ensues. In pleural epilepsy paralysis, if present, is transient. In only one case reported was the sign of Babinski demonstrated. The embolic theory was advanced by Von Dusch, who had a single case which at necropsy showed thrombosis of the pulmonary arteries, small hemorrhages in the cerebral cortex and anemia of the brain. It is interesting to note that cerebral anemia is mentioned in the post-mortem reports of two cases,[6] and also in Osler's System of Medicine.[7] While not supporting the view of Von Dusch, it is worthy of mention that in primary endothelioma of the pleura and in cases of carcinoma of the breast, which infiltrate the pleura, metastasis to the brain is not uncommon.

At present we have a case of endothelioma of pleura, with metastasis to the brain, under treatment. These metastases are easy to understand when we remember that the pulmonic veins carry the blood from the alveoli of the lungs directly to the left auricle and from there to the left ventricle and general arterial system. We could imagine minute particles of foreign matter placed in the interalveolar spaces carried to the brain by the blood. These minute particles may not be large enough to cause a paralysis, but sufficiently large to irritate and cause a convulsion. Embolic phenomena probably occur in parts other than the brain but such parts may not be sufficiently sensitive to cause any disturbance. It is not believed the entrance of air emboli or the injection of a liquid whose specific gravity is different from that of blood could cause such phenomena. Such liquids may, however, serve as a vehicle for the solid particles or emboli. Without denying the possibility of embolism occurring in a few cases, we cannot explain the entrance of emboli into the systemic circulation without penetration of the lung tissue by the foreign substance.

The reflex theory is the one commonly accepted. This theory is based upon the belief that the convulsive seizure is the response of the higher motor centres when the pleural terminations of the peripheral nerves are stimulated by a physical or chemical agent. Experimental work by Gilbert and Roger in

1892, Roch in 1905, Thiroloix and Bretonville in 1910, Cordier in the same year, and in this country by Capps and Lewis, supports this theory. Laborde in 1892 was unable to produce convulsions by electrical stimulation of the intercostal nerves. Roger and Gilbert, working on dogs, produced convulsions in two cases,[8] one by the injection of tincture of iodine into the pleural cavity and the other by the injection of metallic mercury. The injection of air into the pleural cavity caused no convulsion. The same authors also state: "The injection of 1 c.c. of 1 per cent. solution of stovain into the pleural cavity prevented the convulsions, but not the asphyxia that could come from the injection of a large quantity of air. This proves that these phenomena are reflex in origin."

Some of the most important conclusions of Cordier[9] are as follows:—1. The pleural membranes tolerate the injection of air under pressure. 2. The injection of tincture of iodine causes a convulsive attack. 3. Cocaine and stovain, although very toxic to animals, prevent the convulsions. 4. Ligation of the carotids has no bearing on the final results. 5. Resection of the pneumogastrics prevents the convulsions, while resection of the sympathetic does not alter the results. 6. The administration of anæsthetics averts the convulsions. In all these experiments animals with intact pleuræ were used. Later Cordier repeated these experiments on animals whose pleural cavities had been injected with Friedlander's bacillus. The results were practically the same. Capps and Lewis[10] were interested in a closely related subject. They studied the reflex blood pressure changes and referred pain produced by pleural irritation. They concluded that pleural irritation may produce a dangerous or even fatal fall in the blood pressure. In their work on reflex pain of pleural origin they irritated the pleuræ of thirty-five empyema patients, but there is no mention of any convulsive seizure during or subsequent to such irritation.[11]

Analyzing these results it is evident that the reflex theory offers the best and most logical explanation of this confusing phenomenon. It is the only theory that has been supported by experimental work.

SYMPTOMATOLOGY

As we have only five cases to report we are forced to study the forty-nine cases that have appeared in the literature for information as to symptomatology. There are no pathognomonic symptoms of pleural epilepsy. The convulsion is identical with that of idiopathic epilepsy.

The prodromal period in pleural epilepsy is often manifested by an attack of syncope. In a few cases the patients had time to complain of pain or discomfort. The period between the prodrome or aura, and the convulsion, is of short duration, never more than a few minutes. The patient is then thrown into an epileptiform convulsion, which, as said before, does not differ from that of idiopathic epilepsy. Some cases terminate by sudden death, without motor symptoms. Such death may be due to reflex cardiorespiratory inhibition, for which we suggest the name of "pleural shock."[12] The Jacksonian

type of convulsion was noted in one case. In two other cases of generalized convulsions one side was more markedly affected than the other. No explanation is given. Transitory hæmiplegia occurred in nine cases. The side of the hæmiplegia did not necessarily correspond to the side of the empyema. Involvement of one of the upper extremities alone was mentioned in six cases. There was only one case in which the hæmiplegia lasted as long as several hours.

The pulse was rapid and some irregularities and other signs of cardiac embarrassment were noted. The respirations were labored and occasionally of the Cheyne-Stokes' type. In many cases it was necessary to employ artificial respiration.

The temperature did not seem to be affected. It is interesting to note that cough was a rare symptom, and was mentioned in only two cases of the series.

There was nothing characteristic in the cerebrospinal signs. There was often inequality in the pupils with extreme myosis or midriasis. In five cases there was conjugate deviation of the eyes to the right. Convergent strabismus occurred in one case. Disturbance of vision was mentioned in one instance. No olfactory nor auditory disturbance is reported. The facial nerve was involved in three of the hæmiplegic cases. The reflexes were exaggerated. In only one case of transitory hæmiplegia was the Babinski sign recorded as positive.

In the large majority of cases there was incontinence of urine and feces. There were no sensory disturbances. When the convulsions cease the patient becomes stuporous or confused. He is disoriented and retarded. He does not seem to understand questions and cannot give consistent answers. The length of this period of confusion depends upon the number and severity of the convulsions. The patient slowly recovers from the mild attack, and there are no sequelæ. When the convulsions are severe a status epilepticus or profound coma may ensue. Both complications are very serious and the prognosis extremely poor. Death occurred in eighteen cases of the series. The high percentage (35 per cent.) entitles the disease to a more careful consideration.

There is nothing characteristic in pleural epilepsy to distinguish the disease from the convulsions of idiopathic epilepsy. The diagnosis is made from the negative previous history, from the physical findings, and from the fact that the convulsions develop during or immediately following surgical treatment of the pleura or pleural cavity.

REPORT OF CASES

Case I.—G. M., male, white, forty-seven, married. Admitted to the medical wards of the Philadelphia General Hospital with the diagnosis of pneumonia. The past history has no important bearing on the case. No record of epilepsy, insanity, nor tuberculosis. He recuperated from pneumonia, but subsequently developed an empyema (left side). A thoracotomy was performed, and the cavity was irrigated every three hours with Dakin's solution. The discharge decreased

gradually, but a persistent sinus formed. It was decided to inject Beck's paste into the sinus; the paste would serve as an opaque substance for röntgenologic studies and it was believed might be of some therapeutic value. While the bismuth paste was being injected the patient suddenly collapsed. The extremities became rigid and held semiflexed. The pupils were greatly dilated, but reactive. The head and eyes were drawn to the right side, the mouth was foamy. There was no loss of sphincter control. The temperature was normal. The respirations were rapid and labored. The pulse was rapid. The reflexes were increased, but no Babinski could be demonstrated. The patient was semistuporous. He could not answer questions well. Occasionally he said a few meaningless words. In about one hour the patient had a generalized epileptiform seizure, lasting about two minutes. Morphine and atropine were given without any noticeable effect. This convulsion was followed by another period of stupor of about nine hours duration when a second convulsion occurred. In the following two hours the patient had four more convulsions. Three doses of morphine and atropine controlled these convulsions. As there had been no history of previous epilepsy, and as the blood and spinal fluid findings were negative, we concluded that we were dealing with a case of pleural epilepsy.

The patient recovered and has since reported twice for observation. The sinus has closed. He states that he feels well and does his work with fair efficiency. He has had no convulsions since his discharge from the hospital.

Case II.—M. S., colored, male, forty-three years old, laborer. Admitted to the Philadelphia General Hospital with the diagnosis of pulmonary tuberculosis with cavitation. The patient had the characteristic history of the disease. Weakness, loss of appetite, loss of weight, nervousness, cough and expectoration, pain in the side and night sweats. He had the usual diseases of childhood. Was a heavy drinker up to three years ago. There is no history of accidents or convulsions at any period of his life. The family history is essentially negative for epilepsy. The physical examination reveals an undernourished adult with physical signs of tuberculosis of both apices and pleural effusion on the right side. The liver was slightly enlarged. The heart and other viscera showed no gross pathology. The neurological examination did not suggest the possibility of any nervous lesion. Wassermann reaction was negative.

As the pleural effusion was embarrassing the cardiac action, the attending physician decided to aspirate. As soon as the trochar was introduced, the patient had a short convulsion and died before any medication could be administered. No fluid was removed. Unfortunately a post-mortem examination was denied.

The following cases, reported by Dr. Thomas A. Shallow, from the service of Dr. J. Chalmers DaCosta, at the Jefferson Hospital:

Case I.—Case of œsophageal fistula, in which food passed from the œsophagus into the pleural cavity, causing an empyema. Patient had three epileptiform convulsions following the passage of food through the fistulous opening into the pleural cavity. The epileptiform convulsions were followed by a short period of unconsciousness. It was necessary to perform a gastrostomy to prevent the convulsions. Patient subsequently died. Post-mortem findings showed the perforation of the œsophagus into the pleural cavity, with the secondary empyema, which was operated upon and drained. There had been no previous history of convulsions in this case.

Case II.—Male, age thirty-five. Operated upon for empyema following an attack of pneumonia. Five days after operation, during the installation of hypertonic salt solution into the pleural cavity, the patient had several epileptiform convulsions. Installation of hypertonic salt solution was discontinued, and patient recovered without having further convulsion.

CASE III.—Male, age thirty. Operated upon for empyema. About one week after operation, during the installation of Dakin's fluid, patient developed a typical epileptiform seizure. The installation of Dakin's fluid was discontinued for ten days. Installation of Dakin's fluid was then resumed, and the patient had a second epileptic seizure. Installation of Dakin's fluid was then discontinued, and there were no further epileptic seizures. No history of previous convulsions.

In all of our cases reported and in the majority of those of the series studied the statements concerning the previous history of the patients were clear and emphatic. There was no history of previous convulsion; nor was there any history of epilepsy in the immediate family. Diseases of the cerebrospinal system, such as neoplasms, syphilis, tuberculosis, uræmia, and the other toxæmias, were eliminated by careful examination and laboratory studies.

Anatomically we are concerned with the visceral pleura as the site of the reflex terminals. From a practical therapeutic standpoint we are concerned with both visceral and parietal pleuræ. It is believed that many of these accidents can be avoided by using a non-irritating antiseptic solution, which should be injected very slowly, and never under great pressure. The trochars should be sharp and should not penetrate the lung tissues. The use of sedatives prior to the injection is recommended. A patient with a low blood pressure should be treated with extreme precaution.

During the attack the treatment is symptomatic. Care should be taken to prevent any injury to the patient during the convulsion. Artificial respiration may be necessary. Capp and Lewis have demonstrated that there is a fall of blood pressure in many cases of reflex stimulation of a pleura and wisely advise the intravenous use of vasoconstrictors, such as, adrenalin and pituitary extracts. If the heart begins to fail, proper stimulation and support are indicated. Morphine and luminal are the most dependable sedatives. They must be given in sufficient quantities.

CONCLUSIONS

Pleural epilepsy is an epileptiform manifestation occurring when the pleural membranes are stimulated by either physical or chemical agents. It occasionally complicates the surgical treatment of empyema.

The pathology of the disease is obscure. Necropsies have not enlightened us on the subject.

The reflex theory offers the most satisfactory explanation. The reflex action is by way of the pneumogastric (the sympathetic may be involved).

It occurs in patients without previous history of convulsions. Age and race show no susceptibility, but apparently occurs more frequently in men. Low blood pressure predisposes to a fatal termination. Its occurrence does not predispose to idiopathic epilepsy.

The prognosis is guarded. Death occurs in about 35 per cent. of the cases.

Careful use of non-irritating solutions may prevent the attack, while strong sedatives and vasoconstrictors are useful during the attack.

In writing this brief review of the subject it has been our aim to remind the practicing physician, as well as the surgeon, of this epileptiform mani-

festation, which is not rare and not devoid of danger, and which may complicate the surgical treatment of empyema, or even paracentesis of the chest. We would like to emphasize the importance of blood pressure readings to eliminate cases of low blood pressure, and the therapeutic value of adrenalin, pituitrin, luminal, and morphine in the treatment of pleural epilepsy.

Our thanks are hereby expressed to Dr. Thomas Shallow for the report of his cases, and to Dr. C. N. Suravitz for his assistance in locating the references.

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MULTIPLE MYELOMA OF THE PLASMA-CELL TYPE

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Multiple myeloma is a rare form of malignant neoplasia, arising apparently simultaneously from the marrow of several bones, particularly from the ribs and vertebral column. The tumors possess marked osteoclastic but no osteoplastic tendencies; they are richly cellular, often vascular, and rarely give rise to gross metastasis. The myeloma cells are generally thought to be derivatives of the specific marrow elements.

Case Report.—A man, aged fifty-one years, was admitted to the hospital of the University of Pennsylvania, October, 1921, on account of severe pain in the back and inability to walk or even sit, as the erect position greatly aggravated the pain. He gave the following history:

On July 16, 1920, in apparent perfect health, while in the act of lifting a weight of about eighty pounds, he felt something crack in his back and he fell to the floor. He was able to get up in a short time and after resting a few hours walked to his home. He felt as though his back had been injured and rested in bed a day and a half, after which he returned to work and did not notice anything unusual, except that stooping or lifting caused pain in the back. He also noticed that, in walking, unevenness in the pavement developed the back pain and any condition causing a jar of the spine had the same effect. About a month after the first injury the man made a misstep and again fell while at work. Since this time the pain in the back has been worse and has always been aggravated by anything causing movement or strain; even coughing, sneezing and hiccoughing had this effect. Shortly thereafter a lump was observed in the lumbar region and persisted for about three months. (As this had entirely disappeared, its character and relation to the present condition are uncertain.)

The patient continued to work more or less until February, 1921. The pains gradually extended upward until the dorsal region was involved as well as the lumbar, and pains through the chest began to appear. The pain and disability steadily increased, and after June, 1921, the man was able to walk very little and scarcely able to sit up. He complained of pain in his teeth, but on account of a profuse hemorrhage that had followed the extraction of a tooth on a previous occasion, he was afraid to have any others extracted. In June, 1921, he was taken a considerable distance by rail to Philadelphia for Röntgen-ray examination, after which his condition was definitely worse. He attributed this to the movements incident to the trip and the examination.

Previous Medical History.—The patient had measles, chicken-pox and whooping cough when young, and urethritis at the age of twenty-one. Since then he has had occasional attacks of sore throat and rheumatism in the legs at times. No other diseases. The patient related to a physician he had previously consulted,

an accident to his back similar to the one above reported, fourteen or fifteen years ago, which kept him from work for one week, but he was not aware of any trouble resulting from the accident.

Social History.—The man was a foreman in a tannery; he smoked very little, not more than one or two cigars a day; did not use tea and drank one cup of coffee daily. He used alcohol very sparingly, not more than a quart a year.

Family History.—There is nothing in the family history of significance, except that a sister died of what may have been tuberculosis of the throat at the age of thirty-five. Otherwise a rather large family had maintained very excellent health. The patient has five children, all well.

Present Condition.—The chief points developed in the physical examination, in addition to the disability mentioned, were as follows: The teeth were in a very poor condition, many were missing; there was a pronounced degree of pyorrhœa, some teeth were decayed and there was some bridgework. The chest expansion was very limited, breathing being almost entirely abdominal. Showers of fine crepitant and some subcrepitant râles were heard at both bases posteriorly. A blowing presystolic and systolic murmur were heard over the apex of the heart. A lump, somewhat tender to pressure, was felt in the left mid-axillary line, apparently attached to the fifth rib. A smaller lump was felt a little higher up in the right axilla. The entire thoracic and lumbar spine was tender to pressure, but the greatest tenderness was from middorsal to the second lumbar vertebræ. Tenderness extended out to either side of the spine and over the left sacro-iliac region and the left hip.

The reflexes of both arms were normal and equal. The leg reflexes were exaggerated and ankle-clonus was present on both sides. Babinski reflex very slightly present on the left side but not on the right. The sensations were normal. Movements of the arms and legs were normal. There was some enlargement of the inguinal glands on both sides.

The prostate gland was soft, elastic, symmetrical and normal throughout. The seminal vesicles were normal.

The urine contained traces of albumin, with a few hyaline and light granular casts and occasional epithelial casts. Oxalate of lime and ammonium urate were also observed. *A careful test for Bence-Jones albumin was negative.*

Blood Examination.—Hæmoglobin, 36 per cent.; erythrocytes, 1,800,000; leucocytes, 7500; neutrophiles, 67; lymphocytes, 27; large mononuclears, 2; transitionals, 3; eosinophiles, 1; basophiles, 0 per cent.; myelocytes, 0; polychromatophilia, +; anisocytosis, ++; poikilocytosis, +; nucleated reds, 0; basic degeneration, 0. An oxydase stain was also made which failed to show any myelocytes. On October 20, 1921, the leucocyte count was 11,000, and on this date the hæmoglobin was 41 per cent.; neutrophiles, 78; lymphocytes, 13; large mononuclears, 4; transitionals, 5.

A Röntgen-ray examination of the skeleton revealed a widespread process resulting in rarefaction in the vertebræ without expansion of the bones. There were numerous similar foci in both iliac bones, both femurs and the sacrum. Several ribs also showed similar areas of abnormality. There was also a suspicious area in the lower part of each humerus. From the appearance of the skeleton, shown on the Röntgen-ray films, Doctor Pancoast, professor of röntgenology at the University of Pennsylvania, reported the case to be one of multiple myeloma or metastatic carcinoma. Further study of the case led to exclude the probability of the latter condition.

On October 20th, the patient had a chill, followed by an elevation of temperature to 104.4° and pronounced dyspnœa. Examination at this time revealed the presence of bronchial breathing over both bases and a pleural friction rub on the left side. The resonance and fremitus were impaired. Many moist râles

were heard. The patient had the appearance of being very ill. The pulse showed definite weakness and dyspnœa became more urgent. The patient sank steadily from this time and died on October 24th.

Pathological Report.—The necropsy protocol (U. P., '21–459) is given here in abstract and only those organs which were definitely involved by the tumors or which appeared to have any bearing on this condition are described in detail.

Anatomical Diagnosis.—Multiple myeloma of the ribs, vertebral column and pelvic bones; slight arteriosclerosis; moderate cardiac hypertrophy and cloudy swelling; confluent lobular pneumonia of both lungs. Focal hemorrhages in spleen

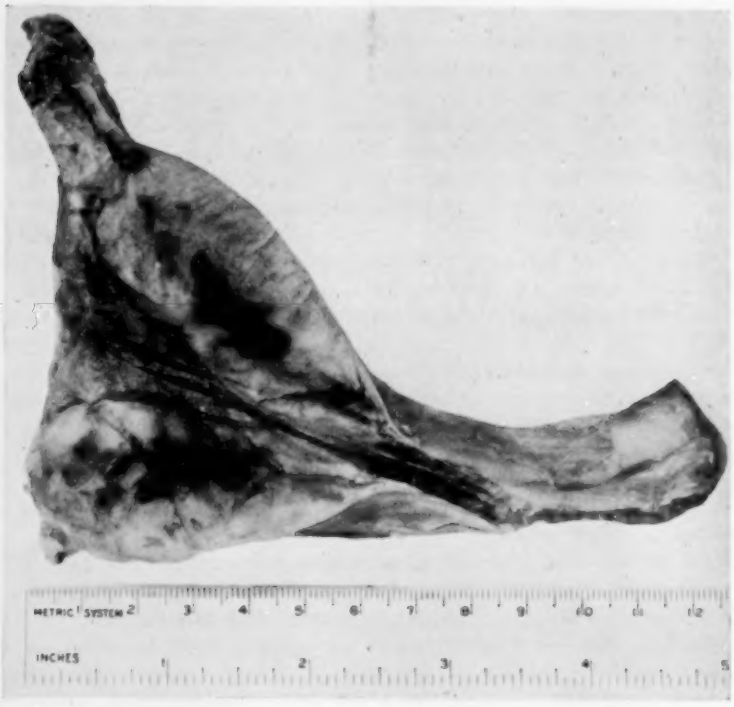

FIG. 1.—Multiple myeloma. The 5th left rib. The tumor is split open; in the centre and scattered throughout the pale mass there are darker hemorrhagic areas. The periphery of the tumor is indefinite.

and atrophy of follicles; subacute tubular nephritis; paralytic dilatation of stomach; marked cloudy swelling of liver; slight fibrosis of prostate.

White male, aged fifty-one years, weighed about 85 kg. and measured 175 cm.; of average stature; well nourished; skin had a sallow tint. No external abnormalities of skull. Marked pyorrhœa and many absent teeth. Indefinite tumor mass felt on the left fifth rib; no palpable tumors over the long bones. No œdema or glandular enlargement.

Bones.—Examination of the bony structures was restricted to the ribs, vertebral column and iliac bones. The long bones and the skull could not be examined.

Ribs.—Practically all of the ribs were the seat of small gray-red tumors which eroded and replaced the bone; this rendered the ribs very fragile and slight pressure produced fracture. Three ribs contained tumors of somewhat larger size; the fourth right rib presented a growth of 7 cm. from its costal junction; this replaced for a distance of 2.5 cm. practically all of the bony structure and had caused fracture of this rib. The tumor was oval in size and measured

2.5 x 2 x 1 cm.; it projected but slightly above the surface of the rib. Its cut surface was generally pale, gray-white and not unlike the cut surface of a lymph gland; there were, however, here and there deep red, soft, hemorrhagic areas. Two similar tumors were present in the seventh right rib, one about 4 cm. from its costal articulation, the other about 6 cm. from its junction to the vertebral column. A still larger neoplasm was located in the fifth left rib; it was oval in size, measured 2.5 x 2.5 cm., began 4 cm. from the costal junction and extended for 5.5 cm. through the body of the bone. (Fig. 1.) Apparently it completely replaced the bony structures; its cut surface was much like that of the first tumor described, that is, it appeared like that of a lymph-node with hemorrhagic softened areas. None of these larger tumors was well circumscribed but had a vague

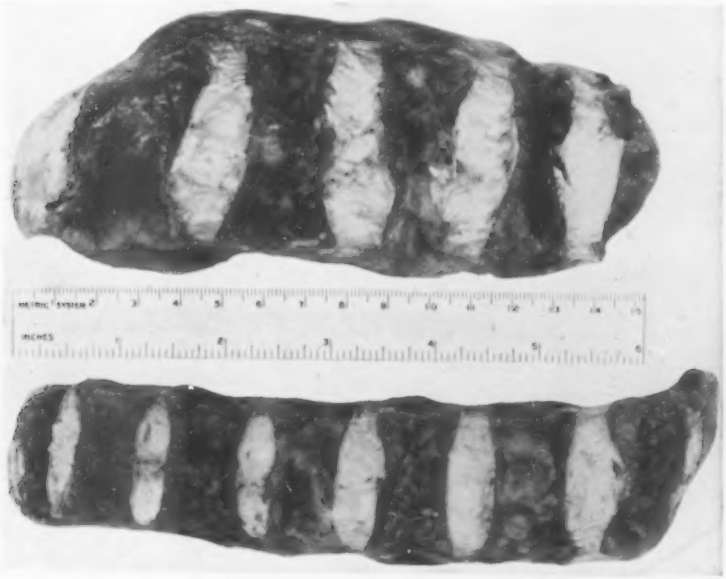

FIG. 2.—Multiple myeloma. Section through the bodies of the lumbar (thicker portion) and the thoracic vertebræ (thinner portion). The tumor has almost completely replaced the bodies of the vertebræ and partly invaded the cartilage. The mottled pale and reddish appearance of the tumor masses and the sharp contrast with the white intervertebral disk is well brought out.

periphery. Practically all of the other ribs con ned small tumors. These were sometimes circumscribed, sometimes ill-defined; frequently their presence could only be demonstrated because at certain points the ribs fractured readily.

The iliac bones when dissected clean appeared normal on the outside, excepting that there were a number of smooth, non-elevated, reddish areas. These proved to be the surfaces of small tumors, which varied from 2 mm. to 10 mm. in diameter; they were scattered throughout all of the pelvic bones and at their site it was easily possible to push a blunt instrument through the bone.

Vertebral Column.—This was examined from the lower cervical vertebræ to the lower lumbar vertebræ. The bodies of all these vertebræ were completely replaced by a reddish-gray, soft tumor mass which contrasted sharply with the white intervertebral discs. (Fig. 2.) The replacement and erosion of the bones was so complete that without any difficulty all of the bodies from the cervical to the lumbar vertebræ were cut out in one piece with an ordinary knife. The spines and the lateral processes of the vertebræ were far less involved and not examined in detail. On the whole, the vertebral column appeared to be somewhat

increased in width, measuring 5.6 cm. in the lumbar portion. The tumors, on the average, measured 2 cm., while the intervertebral discs averaged 1 cm. in thickness. Only occasionally were small bits of bony spicules found. The spinal cord was readily exposed with a knife: it showed no gross abnormality and on histological examination proved to be normal.

Bone Marrow.—This was removed from the middle of the shaft of the left tibia and was found to be normally fatty.

Sections from the tumors and the various organs were fixed in 5 per cent. liquor formaldehyde and in Zencker's fluid. Paraffin sections were stained in hæmatoxylin-eosin, methylene blue-eosin, with Giemsa stain and with Mallory's phosphotungstic acid hæmatoxylin. Frozen sections of the formalin-fixed tissues were used for Goodpasture's oxydase reaction.

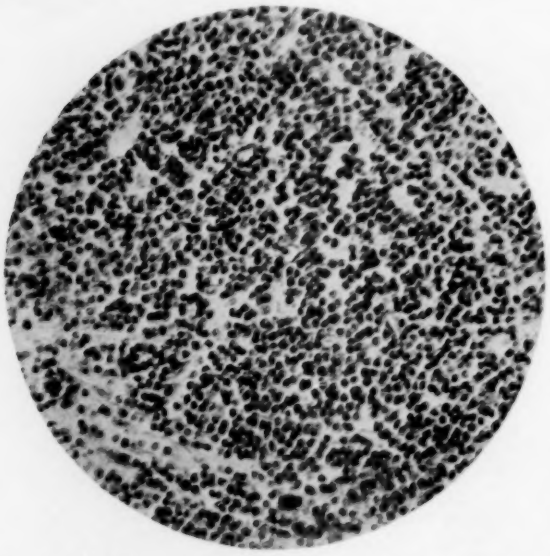

FIG. 3.—Multiple myeloma. Low-power photograph to show the richly cellular sarcoma-like structure of the tumor.

Histological Examination of Tumor.—The tumors from the various places had a similar structural composition. They were all richly cellular, very vascular and poorly supplied with supporting tissue. (Fig. 3.) The latter had an irregular distribution and generally occurred in the form of delicate fibrils which divided the new growths into various-sized groups and columns of cells. There were occasionally dense, wavy bundles of collagenous fibres, usually surrounding well-formed blood-vessels. In the immediate neighborhood of such bundles the fibrillar tissues were most pronounced and here a delicate network enmeshed the tumor elements. (Fig. 4.) At a distance from the coarse bundles the supporting tissue became less and less distinct and formed an ill-defined framework carrying the numerous vessels. (Fig. 5.) The calibre of the latter ranged from that of a capillary to the size of a low-power microscopic field. They were exceedingly thin-walled and, irrespective of size, were lined with a single layer of endothelial cells resting upon a delicate connective tissue. Many of the vascular spaces contained well-preserved erythrocytes, others were filled with granular precipitate and had the general appearance of huge lymph vessels. Tumor cells were often seen within the blood spaces. Only rarely were well-formed normal arteries or veins found. Some portions of the tumors were particularly vascular and here smaller and larger hemorrhages were frequently encountered. In some regions the tumor cells were widely separated by an eosin-staining homogeneous material which frequently contained typical fibrin stars and asters.

The majority of the tumor cells were of similar size; they were oval or round when loosely arranged and polygonal or irregularly formed where they were densely packed; their nuclei were usually eccentrically placed and possessed fairly distinct nucleoli. (Fig. 6.) The measurements for the formalin-fixed tumor cells average 10 x 6 micra; the nuclei average 4 to 5 micra. The chromatin of the

round nuclei was somewhat condensed at the periphery, but coarse, irregular, chromatic clumps were scattered through the nuclear body. A few cells contained two nuclei. The cellular cytoplasm was slightly cloudy but almost smooth and generally basophilic; with methylene blue-eosin and with Giemsa stain, many cells were shown to possess neutrophilic and a few, eosinophilic cytoplasm. In short, the tumor elements somewhat resembled plasma cells. There were, however, certain differences. None of the tumor cells had the pale perinuclear halo so characteristic of plasma cells, nor did they give typical staining reactions.

Scattered between these plasma cell-like elements there were moderate numbers of small round cells about the size of lymphocytes, possessing a compact deep-staining nucleus and very little basophilic cytoplasm. Occasionally a field was encountered with two or three huge, irregular-shaped elements, which closely resembled megalokaryocytes. (Fig. 7.) The oxydase reaction (Goodpasture's method) was applied to frozen sections and smears from different portions of the tumor, but none of the cells presented characteristic granules. As a control, sections from a carbuncle and from an acutely inflamed appendix were used; these reacted positively.

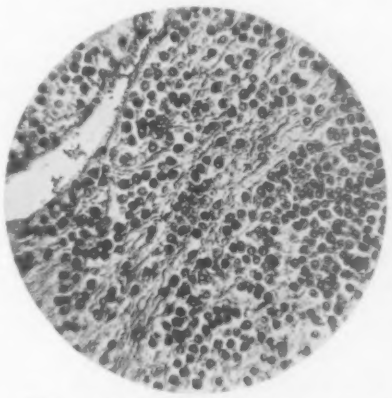

FIG. 4.—Multiple myeloma. Low-power photograph. Between the tumor cells there is shown a delicate fibrillar connective tissue. This is absent in many places.

Intervertebral Disc.—Near its junction with the tumor the cartilage was lumpy, coarsely granular or finely vacuolated; thin-walled small blood-vessels were everywhere penetrating this necrotic tissue and small hemorrhages were frequently seen. There were numerous groups and islands of cells resembling in every detail the tumor cells. No demarcation between tumor and cartilage was present; at all points, however, an irregular necrotic zone was interposed between the invading tumor and the cartilage. (Fig. 8.)

Spleen and Liver.—In many of the blood spaces of the liver and the spleen there were occasional plasma cell-like elements which possessed the same morphology as the cells of the tumor. These occurred nowhere in groups but were always widely scattered.

Kidneys.—Left kidney weighed 200 gm. and measured 12.5 x 6 x 4 cm., and was flaccid. The capsule stripped readily, leaving a mottled, pale, yellow-brown, smooth surface. The cut surfaces were somewhat moist, the edges quite swollen. The cortical zone averaged 10 mm., was pale, yellow-brown and turbid. The glomeruli and striations were fairly distinct. The striations of the medulla were plainly marked. The right kidney resembled its fellow. Histologically the capsule was moderately thickened. Just beneath it and extending into the outer zone of the cortex there were small, irregular, cellular areas composed mainly of small round cells resembling lymphocytes and occasional larger elements, with rather pale, indented or oval nuclei; these the writers take for endothelial leucocytes. A very occasional polymorphonuclear leucocyte was encountered. The tubules in such cellular regions were compressed. There was a very slight focal, intertubular fibrosis accompanied by a lymphocytic infiltration. Many glomeruli possessed a thickened capsule, others were fibrosed and hyalinized, while yet others were small and atrophic. The majority of the tufts, however, were of large size; their coils were engorged, but did not contain foreign cells; there was no proliferation of the

capsular epithelium. The arteries had irregularly thickened, partly hyalinized mediæ, but no conspicuous narrowing of the arterial lumena was present. The capillaries were well filled in the medulla and inconspicuous in the cortex. The convoluted tubules had poorly staining, frequently anuclear lining; most of the cells contained fine to moderately coarse hyaline droplets and minute vacuoles. The cells of the tubules of Henle were pale staining, but otherwise fairly well preserved; the collecting tubules appeared quite normal.

Discussion.—Multiple myeloma is a very rare type of new growth. Wallgren,[2] in 1920, collected all the reported cases in which the clinical diagnosis had been sustained by histological examination. He found 105 and added to this number 13 new cases which he had studied himself. Symmers[3] encountered only 3 cases among 6000 autopsies in the Bellevue Hospital, New York. The age and sex incidence have been analyzed by Wallgren in 98 histologically proved cases of the disease; there were 66 men and 32 women. The most frequent age period at which the symptoms first appeared was from forty-five to sixty-five years; the youngest case reported in the literature was twenty-two and the oldest eighty years. Wallgren's monograph is so recent, and deals so thoroughly with all phases of the subject, that we shall merely discuss briefly certain points of interest in the case reported above.

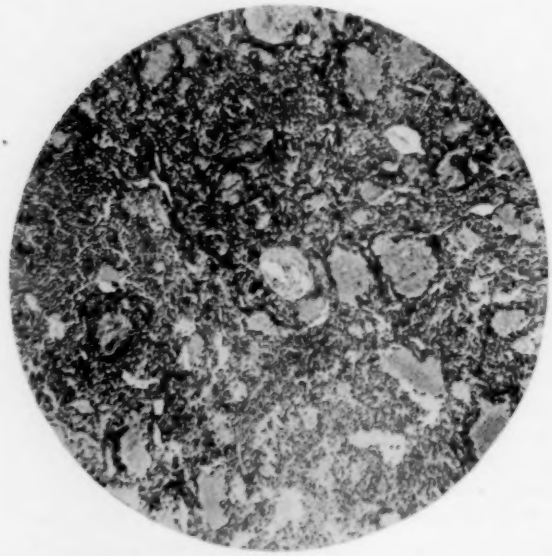

FIG. 5.—Multiple myeloma. Low-power photograph showing many large and thin-walled blood channels. The vascularity varied considerably in different portions of the tumor.

Relation of Traumatisms to Myeloma.—The patient gave a history of an ancient injury to his back and a recent injury which precipitated his symptoms. In the literature a similar relation between trauma and myeloma is frequently recorded, and this is of interest not only etiologically but from the medico-legal standpoint. In the case here reported, the insurance company which had assumed the liability of the patient's employer was very insistent on obtaining an opinion as to whether the patient's condition was due to the accident described. Inasmuch as most states have workmen's compensation laws at the present time, and as most workmen receive some injury from time to time, this point becomes one of major importance. An analysis of the reported cases of myeloma gives us the impression that the injured bone was already diseased and that the traumatisms merely called forth definite symptoms.

Absence of Bence-Jones Protein from the Urine.—Through a misunderstanding but a single examination for Bence-Jones albumose was carried out, but this was most carefully made by Dr. Thomas A. Cope, an experienced laboratory investigator. The negative result is not incompatible with the disease, for, as Boggs and Guthrie [4] and others have shown, this albumose may be absent in undoubted cases of myeloma. On the other hand, its occurrence is not limited to this disease but it may be present in destructive processes of the marrow due to any cause, such as carcinomatous or sarcomatous invasion, osteomyelitis or chronic myelogenous leukæmia. Wallgren tabulates 51 cases of myeloma in which the urine contained albumin and in which tests for Bence-Jones protein were made. In 42 of these the albumose was present, and in 7 it was absent.

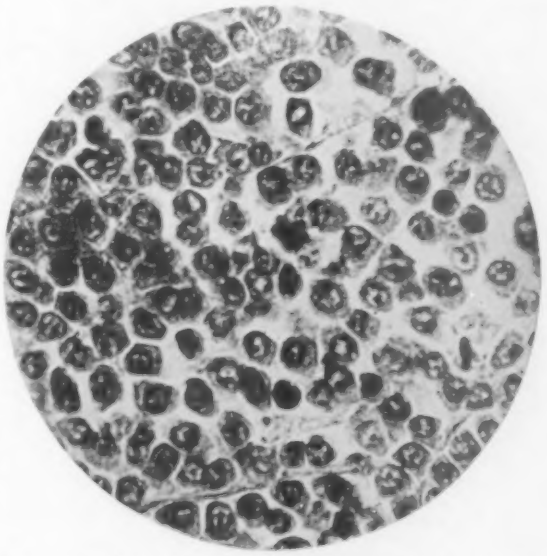

FIG. 6.—Multiple myeloma. High-power photograph showing the plasma cell-like character of the myeloma cells.

Diagnosis of Myeloma.—The symptom which brings the patient to the physician is usually, as also in our case, pain; quite often this begins suddenly and violently, but sometimes it is at first relatively light and gradually increases in severity as the disease progresses, until the slightest exertion may bring about excruciating suffering. In our case even sneezing or coughing produced this result. The appearance of an eroding bone tumor, which often leads to spontaneous fractures, is common, but sometimes the neoplasms may so diffusely infiltrate the marrow cavities as to cause no demonstrable swelling.

Most important is the information obtained from the Röntgen-ray examination, but in order to be of value it must be carried out by a person thoroughly versed in radiographic technic. This fact was well shown in the case here reported. Röntgen-ray plates had been taken four months prior to coming under our observation by an experienced röntgenologist, who reported fracture of the spine; the plates were also examined by a number of surgeons, who apparently did not suspect the possibility of the presence of myeloma. Referring to this point, Symmers, in the article mentioned, says: "In the case of diffuse metastatic or myelomatous infiltration of the marrow the Röntgen-ray sometimes is powerless to register a shadow." The observation we desire to make here is that when the patient was admitted to the University Hospital, bringing with him the Röntgen-ray plates taken four months previously, Doctor Pancoast was able to make the diagnosis of multiple myeloma or

metastatic carcinoma from these. Röntgenological studies made at the University Hospital after admission confirmed this opinion. Inasmuch as there was no evidence of a primary carcinoma having existed, and on account of the other factors present, it seemed reasonable to settle on a diagnosis of myeloma. It will be understood, however, that in order to arrive at a correct opinion the Röntgen-ray must show in detail the structure of the bones examined and the plates must be read by a person who can detect abnormal difference in density even though slight. The most characteristic feature appears to be a diminished density, due to the absorption of lime salt, which is replaced by the tumor tissue.

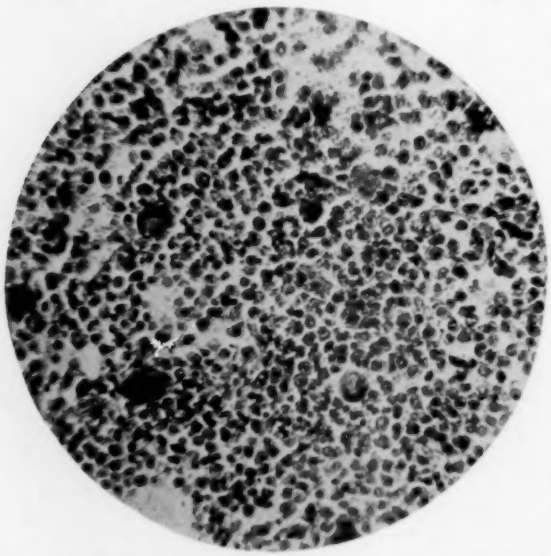

FIG. 7.—Multiple myeloma. Low-power photograph showing several large, irregularly nucleated cells which resemble megalokaryocytes.

Information of diagnostic value may be obtained from examination of the blood. In most of the reported cases there was a marked diminution in the number of erythrocytes and a correspondingly marked reduction in the percentage of hæmoglobin. The white cells usually exhibited no distinct changes, there being neither a definite alteration of the total nor of the differential leucocyte count. Tumor cells have occasionally been reported in the peripheral blood stream. Indeed, it is surprising that in view of the great vascularity of the neoplasms and the frequent presence of myeloma cells within the blood channels of the tumor such cells are not more often encountered in the peripheral circulation. In our case numbers of myeloma cells were present in the spleen and in the liver; it is possible that they undergo destruction in these organs.

The frequent coexistence of nephritis and myeloma has been emphasized, and Wallgren even hints at a possible distinct relation between these affections. In any case it is to be borne in mind that most sufferers of myeloma are likewise afflicted with a more or less severe renal disease.

Lastly, it must be thoroughly understood that there is no essential clinical difference between myeloma and other primary tumors involving the skeleton. The combinations of pain, bone deformity, spontaneous fracture, the existence of Bence-Jones albumosuria, the marked anæmia and the practically unchanged white cell count, together with the Röntgen-ray picture, should direct attention to this disease. The final and absolute diagnosis at present must still rest upon a histological examination of the tissue.

Treatment.—Greenough and his associates [5] report 9 cases of myeloma appearing in the records of the Massachusetts General Hospital and Collis P. Huntington Hospital from January 1, 1911, to January 1, 1921, but pathological proof of the diagnosis was obtained in only 3. These 3 cases showed the microscopic picture of plasma-cell myeloma, but in none did it appear to be systemic, and Bence-Jones albumose was never demonstrated. Two were instances of solitary foci of disease, one in the ilium and the other in the humerus.

The first case died of hemorrhage after an exploratory operation. The second case was alive and well three months after incision and curettage. The third case is of interest in that the tumor appeared first in the orbit; two excisions were performed with enucleation of the eye. Two years later another tumor developed in the lower jaw. This was excised, recurred and was again excised, and the cavity treated by radium insertion. The case is now two years under observation without recurrence.

FIG. 8.—Multiple myeloma. Junction of tumor and intervertebral disk. Note the invasion of the somewhat necrotic cartilages by the tumor cells. The hemorrhages described in the text are not shown in the photograph.

It is still an open question as to whether myeloma is always multiple, for the earlier stages are rarely seen, or whether a "solitary" and a "multiple" type exist. Surgically the treatment of multiple myeloma at present seems to be hopeless.

The Nature of Myeloma. It is not known whether multiple myeloma belongs to the class of true tumors or whether the disease is a tumor-like systemic affection. The arguments brought forward to support this or that belief seem to be inconclusive, but the majority of observers at present classify the condition as a neoplasia.

The type cell of multiple myeloma has been variously regarded as being identical with or related to the plasma cell, myeloblast, myelocyte, lymphocyte, erythroblast and osteoblast, and the corresponding tumors have been named, respectively, plasmacytoma, myeloblastoma, etc. Most types of myeloma were, however, regarded as belonging to these two varieties. In Wallgren's 13 cases the cells of the tumors closely simulated plasma cells, but they equally closely resembled myeloblasts; this has been true in many other reported cases, and many observers seem to have been uncertain as to whether the tumors belong to the plasma cell or the myeloblastic type. The oxydase reaction has

frequently been employed for differentiation, but it has lately been emphasized that this reaction is insufficient for such a purpose. A negative reaction does not prove the tumor not myeloblastic in origin. Christian,[6] who had an opportunity to examine 11 cases, some of which had been previously published under different titles, believes that the tumor elements were all of the same type. Wallgren believes that the cells composing myeloma are best called by the indifferent name "myeloma cells," and that the classification into plasma cell and myeloblastic type should be discontinued.

As to those tumors which have been named lymphocytoma, erythroblastoma and myelocytoma, he believes that the cell types have probably been misinterpreted, and he states particularly that no cases of the undoubted lymphocytic cell types of myeloma have been reported in the last twenty years; differences in fixing and staining methods are possibly responsible for the diversity of interpretation. Morse[7] recently studied three cases of multiple myeloma and discusses the histogenesis of these tumors; he presents data to support his theory that the "plasma-cell myelomata" spring from a series of cells whose specific function is bone absorption and that the myeloma cell may be a heteroplastic osteoblast. We have carefully compared the cell types of our case with those illustrated in various papers on the subject, and we feel that the tumor cells of the case reported very closely resemble those of most of the other recorded cases, no matter whether such cases have been looked upon as being of the plasma cell or of the myeloblastic type. If we, in spite of our conviction that the cells of myeloma are of an indifferent type and should not be regarded as either plasma cells or myeloblasts, report our case as a "plasma-cell type" of myeloma, we do so in view of Morse's important theory mentioned above. The moderate number of small round cells which were found scattered throughout the tumors are regarded by us as being reactive lymphocytes. Similar elements are practically always found in any type of tumor and particularly at its periphery. The large cells which resembled megalokaryocytes are probably remnants of the destroyed marrow or they may be conveyed to the neoplasm through its many blood channels, which in all likelihood communicate to a certain extent with the blood channels of the marrow.

It is interesting that in our case, as well as in many of those reported, there were undoubted transported tumor cells in the spleen and in the liver. Probably it is in the rare instances in which these cells are not destroyed in the organs mentioned that gross metastases have been found.

Lastly some mention must be made of the well-marked subacute nephritis in this case. At present it seems unlikely that the frequent coexistence of nephritis and myeloma should be anything but an accidental one, or at most, due to the abnormal proteins formed by these tumors.

Summary.—A white man, aged fifty-one years, and hitherto in apparent health, fell suddenly to the floor while lifting a heavy weight. Since that time he suffered from pain in the back exaggerated by the slightest motion and exertion. A few months later similar pains occurred in the chest.

After a long railroad journey his condition became much worse and he finally was unable to sit or walk because of extreme pain in the back or chest. A Röntgen-ray examination showed a widespread rarefaction of the lumbar vertebræ, the ribs and pelvic girdle and both femurs. Tender lumps could be felt over several of the ribs. The urine contained traces of albumin but no Bence-Jones protein. There was a profound anæmia but no definite change in the white cells. The patient died of pneumonia. The post-mortem examination disclosed numerous soft, gray-red tumors in the ribs, the vertebral column and other portions of the skeleton, which had partly eroded the bones and rendered them very fragile. The vertebral column in particular was much involved, the bodies of the vertebræ being almost completely replaced by tumor masses. Histologically, the neoplasms were richly cellular, contained very little supporting tissue and were composed chiefly of elements which somewhat resembled plasma cells; these did not give an oxydase reaction. Similar cells were found in the blood spaces of the spleen and the capillaries of the liver.

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TRAUMATIC LESIONS OF THE HEAD*

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We are constantly confronted with problems in head injuries as to the best procedure to follow, realizing that the slightest traumatism may cause a fatal lesion and an apparently severe traumatism may be associated with very little pathological change. Etiology, therefore, deserves comparatively little consideration from a diagnostic viewpoint. We must consider particularly four factors. First, injury to the brain substance; second, hemorrhage from the pia-arachnoid; third, injuries to the skull proper; and fourth, meningeal hemorrhage.

In taking up the first of these subdivisions, we see most frequently concussion, associated with cerebral lacerations and cerebral hemorrhage of the smaller vessels in the substance of the brain. If you believe that concussion is the result of a molecular disturbance or a chemical change in the brain cells and that the irritation brought about by the injury resulting from this disturbance varies in its duration from a few seconds to a number of hours, or, if you believe that concussion is associated with lacerations of the brain; punctate hemorrhages or contusion of brain, a view held by Duret, Keen and Kocher, you may find a certain basis of truth in both arguments.

In support of the first theory, it can be stated that in a majority of head injuries there is a transient loss of consciousness, lasting from a few seconds to several minutes, at the expiration of which time consciousness is entirely regained. On examining such a patient we observe a slow and low tension pulse, pupils which react promptly to light, a subnormal temperature and no disturbance in respiration. It certainly seems with these transient symptoms that very little organic change has occurred in the brain substance. On the other hand, in the more severe cases we find that unconsciousness is prolonged, that the patient's pulse may be as low as 60 or less and the blood-pressure proportionately low and the patient regains consciousness after hours of quiet unconsciousness.

In support of the second view we may cite the type of case in which the patient lies curled in the bed in a position of acute flexion. We attempt to examine the pupils and the individual tightly closes the eyelids, twists the head and moves the hands in an effort to push you from him. He resists movements of the hands and the legs but can usually be partially roused by shouting and pinching. These patients are then showing the symptoms of laceration and hemorrhage of the brain, and in their present state an eye-ground examination, necessary to an accurate diagnosis of intracerebral pressure, is almost impossible to make. The pulse in these cases varies between 60 and 90

* Read before the Philadelphia Academy of Surgery, February 5, 1923.

and is of low tension. One pupil may be dilated and the other contracted but they will both react to light, although not with the same degree of promptness as in pure concussion. We treat these patients by repeated lumbar puncture and drainage of the spinal theca every twelfth hour.

When stupor has lasted for hours, and the hours have stretched into days, should we, in the absence of ability to determine what associated signs or symptoms are hidden beneath this mask of stupor or semiconsciousness, jump to a conclusion? Should we pin our faith to the manifestation of the influence of pressure on one nerve, the oculomotor, when we have eleven other nerves subject to equal amount of damage as a result of pressure, but whose symptoms of disturbance are neither evident to the examining eye, as in the case of the oculomotor, nor can be elicited from an insensible patient? Where the pressure is insufficient to cause death and the patient recovers consciousness, at the end of days or weeks, blindness, deafness, epilepsy, muscular paralysis, change of character or insanity or some other effect of pressure may be present. Do you not think in such cases the pathological process must extend beyond anything that can be termed "concussion" and such cases are instances of subdural hemorrhage?

In support of these statements the following cases are submitted:

CASE REPORTS

CASE I.—R. B., age forty-eight, history No. 3499. Chief complaint epileptic seizures. He gave a history of having been injured twenty-one years ago when he was struck on the head by a piece of falling iron. Then for five days he was unconscious. These convulsions had been present for eighteen years, having had their onset three years after the accident. They continued as generalized convulsions for fourteen years, on the average of two to three weeks apart, until four years ago when, in addition to the generalized attacks which now became infrequent, he had convulsions which were limited to the left arm and not associated with loss of consciousness, except on rare occasions. The arm first twitched, then was convulsed and the patient turned his head towards the left and had double vision. Diagnosis by Professor Dercum of Jacksonian epilepsy. Examination was negative as to choked disc and optic atrophy. Operation November 4, 1922; osteoplastic flap, over the right motor area. A collection of fluid in the subarachnoid space covered the whole motor area and upon examination looked exactly as a chemosis would look in the conjunctiva. This area collapsed upon inserting the finger and freeing the adhesions. Immediately following the operation he had a number of convulsions but did not have any additional ones until two weeks ago when he had another attack of the generalized type. This case is not cited as a success in the treatment of epilepsy, but as an example of early conservative treatment resulting in years of epileptic seizures which might have been prevented by prompt radical intervention.

CASE II.—A. C., age forty-five, history No. L 881, came to the hospital complaining of pain in the left side of the head and spasticity of the right arm and leg. In November of 1920, he was struck while unloading a car of stone. He was unconscious for a number of hours. He was then taken to an hospital, where two operations were performed a number of weeks after his injury. Examination was negative as to choked disc and optic atrophy. A third operation was undertaken in Jefferson Hospital because it was thought that there was still some pressure upon the motor area of the left side. The dura was found to

be greatly thickened (external pachymeningitis); there was no evidence that the dura had ever been opened. The dura was then opened. As in the former case, there was an encysted collection of fluid over the left motor area which collapsed on splitting the adhesions. A piece of cow's horn was transplanted to fill in the cavity left by the previous operations. Within ten days the man was able to grip objects with the right hand and, at the end of sixteen days, was able to walk without a cane.

These two cases clearly indicate that, following a head injury, unconsciousness over a period of a few hours should lead the surgeon to suspect that he is dealing with more than pure concussion and with more than a trivial laceration or contusion of the brain. Had a lumbar puncture been performed upon these two cases, bloody fluid, no doubt, would have been found and prompt drainage of the subdural space, by means of a subtemporal decompression, might have prevented these serious results.

In a case where a definite fracture of the skull exists either in the vault or the base, we are again confronted with the question of operation. In fracture of the skull we are taught by some that we should not operate unless there is definite evidence of compression, manifested frequently by a pupil which fails to react to light, by a pulse-rate of 60 or under and by a blood-pressure which is higher than normal and is becoming higher; these manifestations occurring in a patient who has not returned to consciousness, unconsciousness being associated with beginning stertorous respiration. The following cases are cited as additional witnesses to the fact that disastrous pressure may exist within the dura without the classical clinical manifestations of compression.

CASE REPORTS

C. P., age forty-one, history No. L 5800, whose chief complaints were failure of vision in the right eye, impaired use of the left arm and leg and spasticity in both. This man fell from a tree in July, 1922, and was taken to an hospital where he lay in a stupor or a semi-conscious condition for seven days and was discharged at the end of one month. No operation was performed. An eye ground examination by Dr. W. M. Sweet was made January 15, 1923, six months after the injury and showed that the pupil of the right eye did not react. He has vision for moving objects and has advanced primary optic atrophy. In the left eye the pupillary reaction required one minute. Diagnosis: (1) Fracture of base of skull, hemorrhage into optic nerve in front of chiasm; (2) subdural hemorrhage causing spasticity of left arm and leg. No operation was performed.

S. P., age thirty-four, history No. L 2080, was brought to the Jefferson Hospital on August 22, 1922. He was unconscious, pupils reacted to light but the eyes showed nystagmus both rotary and lateral. There was a discharge of a large quantity of thin, bloody fluid from the left ear. He reacted from his concussion within two hours. The nystagmus lasted twenty-four hours. The X-ray examination showed that he had a linear fracture running through the left parietal bone and involving the base of the middle fossa. There were no definite signs of compression, that is to say, the pupils both reacted, although the left less promptly than the right. The pulse, while it was 70, was of low tension. His breathing was regular and not stertorous. An eye ground examination taken at this time showed no evidence other than a slight hyperemia of the left disc, and full, tortuous veins. The patient was kept in bed fourteen days. When he

attempted to walk he had marked ataxia, a positive Rhomberg and exaggerated knee jerks. There was neither a Babinski nor clonus, and he was unable to hear out of the left ear. Eye ground examination again taken showed that the discs were hyperemic and the margins indistinct, suggesting pressure. Operation one month later. Subdural decompression on the left side revealed an encysted collection of slightly colored fluid in the subarachnoid space. The patient was able to leave the hospital several weeks after the operation and he says that he is still dizzy, has ringing in the left ear, hears with difficulty and has disturbance of equilibrium. His deafness was due to injury to the cochlear nerve and his disturbance of equilibrium, vertigo and tinnitus were due to irritation in the vestibular nerve caused by hemorrhage into the labyrinth.

H. C., age fifty-five, history No. J 3292, was brought to the Jefferson Hospital, November 2, 1920, having been struck by an automobile. On admission he was unconscious, reacted in one hour, following which he was confused, incoherent; and not until the end of four days was able to recognize his sister. His pulse rate fell to 54, his blood-pressure was 140, and his pupils reacted to light, and it was, therefore, concluded that he was in a state of concussion. Within three hours, the pulse rate rose to 60 and the following day was 72. The blood-pressure never increased. Two days following admission Battle's sign (longitudinal ecchymosis over mastoid) was noted. Eye report, November 3rd; pupils equal and react to light. Eye ground normal. November 6th, three days afterward, he had hyperemia of the left disc and retina. November 12, 1920, hyperemia persisted. November 21, 1920, low grade optic neuritis is still present. November 29, 1920, low grade neuritis persists. Examination by Professor Dercum showed traumatic confusion. He was discharged at the end of one month little improved but was able to walk fairly well.

It is by no means the purpose of this paper to convey the impression that all fractures of the skull should be trephined. The following is an example of the class of cases which requires no operative interference.

I. B., age fifty-one, history No. L 3988, was struck by an automobile, December, 1922. He was unconscious and had bleeding from right ear. Following one hour of unconsciousness he was in a stupor for a number of hours, after which he gradually returned to consciousness. The pulse rate was 70, the blood-pressure 150. The X-ray showed a linear fracture of the left parietal bone which extended into the mastoid. There was no operation. Result: complete recovery.

It is difficult to discuss head injuries without some reference, however brief, to meningeal hemorrhage. The symptoms of this can be classified as secondary unconsciousness occurring after a period of primary unconsciousness associated with symptoms of compression.

Our plan of procedure in all head injuries is to observe hourly temperature, pulse and blood-pressure, to rouse the patient, and if possible, to get him to count up to twenty. If he is stuporous, irritable and is not able to follow our train of reasoning, the nurse or the resident physician is instructed to observe the respiration. If the patient can no longer be aroused, if his respirations become stertorous, if he shows signs of cortical irritation (rigidity of an arm or of a leg, convulsions, etc.), if the pupil is dilated and fails to react, or if he has a slow, high-tension pulse, a diagnosis of extradural hemorrhage is made.

We call attention to E. L., history No. J 4180, who fell on a slippery pavement and was brought to the station house, supposedly drunk. The following day he was admitted to the Jefferson Hospital with spasticity of the left arm and leg. His right pupil at first reacted sluggishly to light and within six hours was dilated and failed to react to light. He was not entirely unconscious but could be roused. On admission his pulse rate was 72, which in the course of six hours fell to 40. Blood-pressure on admission was 160 which fell to 140. It is interesting to note here that the blood-pressure did not rise with the pulse fall. Operation disclosed hemorrhage from the anterior and posterior branches of the meningeal artery. He made an uneventful recovery with the exception of an epileptic seizure which occurred six months after the operation; there has been none since.

CASE REPORTS

M. M., history No. K 121. Cause: automobile accident. On admission patient was unconscious. Stertorous respiration, pulse rate 52, blood-pressure 120. Operation revealed depressed fracture of the parietal bone, subdural and extradural hemorrhage. Terminated fatally seven days after operation.

H. P., history No. L 5458. Cause: struck by automobile. Unconscious several minutes. Pulse rate 54, blood-pressure 120. Eye ground normal. X-ray diagnosis: linear right parietal fracture extending into base. No operation. Recovered.

R. M. Cause: gun-shot wound of left frontal region of head. Patient entirely conscious with lodged bullet. Facial palsy. Eye ground: low grade optic neuritis. X-ray findings: fragment of bone had penetrated and lodged in frontal lobe on right side. There are several small fragments of bone along the course of the bullet which is lodged behind the motor area. Operation: removed the bullet and bone fragments; osteoplastic flap. Result: discharged with no apparent bad effect.

R. T., age nineteen, history No. 4062. Cause: fell three stories. On admission (3 P.M.) patient was unconscious. Reacted from unconsciousness and went into irritable stupor. Right pupil reacted promptly, the left more slowly. The stupor became more pronounced and at 10 P.M., seven hours after admission, he could be roused with great difficulty. The left pupil still reacted very sluggishly. The spinal puncture showed blood in the spinal fluid. Pulse on admission was 70, blood-pressure 120. Pulse gradually fell to 56 and blood-pressure rose to 140. Operation showed a depressed fracture of the left occipital and parietal bone. Extensive extradural hemorrhage and laceration of cortex of brain. Recovery.

Thomas D., age thirty, history No. J 6637. Cause: fell from second story window. On admission unconsciousness profound. Stertorous respiration. Right pupil dilated and did not respond to light; left pupil moderately dilated with sluggish reaction. Cerebrospinal fluid bloody. Pulse rate 64; blood-pressure 160. Operation showed a fracture of the parietal bone, extradural and subdural hemorrhage. Recovered.

D. F., age six, history No. K 4784. Cause: struck by automobile. On admission profound coma. Pulse rate 100, blood-pressure not taken. Temperature 100⅕°. Right pupil widely dilated; did not react to light. Left pupil dilated but reacted to light. At operation there was no evidence of fracture or extradural hemorrhage. Discoloration beneath the dura which was incised. Large quantity of bloody cerebral fluid, dark in color. Recovered.

M. K., age thirty-five, history No. J 1907. Cause: fell five stories. On admission, profound coma, stertorous respiration. Left pupil widely dilated and did not react to light. Right side of body rigid and there were two convulsions on the way to operating room. Operation revealed a fracture of the left parietal

bone extending to base. Extensive subdural hemorrhage. Result: Patient died on table.

G. S., history No. K 2571. Cause: struck by trolley car. Symptoms: profound unconsciousness. Stertorous respiration. Left pupil moderately dilated; reacted sluggishly to light. Right pupil dilated and reacted to light. Pulse rate 71, blood-pressure 160. Thirty minutes after admission pupil still reacted to light very sluggishly. Pulse rate rose from 70 to 120 and the blood-pressure fell from 160 to 118. Operation showed a comminuted fracture of the left parietal bone which extended into the base. An extensive extradural hemorrhage. The dura was distended before incision and showed a bluish discoloration beneath. Drainage. Result: recovery. He had mental confusion and had to be restrained for four days following the operation.

J. R., age twenty-four. Fell from a scaffold three floors high. Upon admission profound coma. Pupils reacted. Lumbar puncture showed bloody cerebrospinal fluid. Operation revealed fracture left of parietal region. Subtemporal decompression left side. Blood-pressure and pulse were not elevated. Result: recovery.

J. D., age six. Cause: automobile accident. On admission profound coma. Generalized convulsions. Right pupil widely dilated and did not react. Fracture of the right parietal region extending into the base. Operation: four decompressions, two on each side with drainage on each side. Result: recovery.

THE COMBINED ABDOMINO-THORACIC APPROACH IN OPERATIONS FOR DIAPHRAGMATIC HERNIA

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The subject of diaphragmatic hernia has received extensive attention within the last five years. As many writers have suggested, this increased interest in what was formerly considered a very rare condition is due to two factors, the increased use of the Röntgen-ray as a method of diagnosis and the numerous war wounds of the diaphragm which were followed by diaphragmatic hernia.

It is not the purpose of this article to enter into an extensive review of the literature on this subject. A very recent article by Truesdale [1] reviewed the subject quite completely and carried with it a bibliography of the recent literature. In addition to this an article by Frank [2] contains a further extensive collection of references. As a medical condition becomes recognized with increasing frequency, interest shifts from its rarity and is diverted to the question of treatment. The purpose of this paper is to call attention particularly to the best method of procedure in dealing with this type of hernia.

There have been in general three methods of operative approach employed —the abdominal, the thoracic, and the combined abdominal and thoracic. The combined approach has been described chiefly in the French literature, particularly by Auvray.[3] His is a much more formidable operation than the one which the present writer wishes to advocate, and will be considered in detail a little later.

To present the facts on which this paper is based the following case is briefly outlined, special emphasis being placed upon the operative difficulties encountered and the conclusions derived from them:

> A soldier, S. L., was admitted to Base Hospital 18, A. E. F., March 2, 1918, with definite signs of acute intestinal obstruction of three days' duration. There was no history of wound or any other injury and no marks or scars on his body. An exploratory laparotomy was done through a lower right rectus incision by Dr. Charles H. Watt, one of the officers on the surgical service. The small intestine, the ascending colon and transverse colon were found to be distended while the descending colon and sigmoid were found to be collapsed. The distended bowel was traced around to the neighborhood of the splenic flexure. At this point the bowel seemed to be caught in some manner not easily determined because of its inaccessible position from the incision. Traction was made on the distended bowel, without great force being used, and the obstruction was felt to give way, following which gas and liquid contents moved down into the descending colon. It was felt that the obstruction was definitely relieved, and while the precise nature of the trouble could only be surmised it was supposed that adhesions which had kinked the bowel had been released or a volvulus untwisted, thus freeing the obstruction. The incision was closed and the patient progressed fairly favorably for several days, when the obstruction again returned accompanied by distention, crampy pains and vomiting.

The fact that the trouble had been in the splenic flexure, close under the diaphragm, then suggested that the case might have been one of diaphragmatic hernia. Dr. C. G. Guthrie, chief of the medical service, examined the patient in consultation and found a tympanitic area in the left chest. Feeling quite sure that the case was a diaphragmatic hernia we proceeded to have a fluoroscopic examination made by Dr. Charles A. Waters, which showed a definite dome-shaped mass, above the diaphragm in the left side of the chest, which descended with inspiration. It was at once decided to operate on the patient, and this time operation was done by the writer, with the help of Doctor Watt, on March 7, 1918. A high left rectus incision was made and the splenic flexure was found to pass into the chest through a small hole in the dome of the left half of the diaphragm. The bowel was very tightly incarcerated in the opening through the diaphragm and did not yield to very determined efforts to draw it downward. In short we were confronted with an irreducible hernia.

It was evidently necessary to divide the edge of the diaphragmatic aperture so as to release the incarcerated bowel. However, this proved to be a very formidable task. The point to be reached was high up under the dome of the diaphragm. The costal margin was in the way, and distended bowel further complicated the difficulties. The neck of the hernia could not be seen, and to pass a knife upward and cut by blind touch was regarded as an extremely dangerous procedure. Before the operation it had been considered wise to prepare the patient's chest as well as his abdomen, with the possibility in mind that it would become necessary to open the chest. When the condition just described was found, it was decided without further delay to do an immediate thoracotomy. The left hand was kept in the abdomen and pushed upward against the chest wall at the level of the hole in the diaphragm. This enabled the operator to judge exactly which rib would give best access to the part of the diaphragm in which the hernia was situated. This rib, which turned out to be the sixth, was then exposed by a six-inch incision along its course. The rib was resected subperiosteally and the left pleural cavity was opened. Immediately the strangulated loop of bowel, which happened to be the splenic flexure of the colon, was presented to view. Another effort was made to reduce the bowel, by traction with the left hand in the abdomen and pressure with the right hand in the chest. This again failed. Then the index-finger of the left hand was used to lift the diaphragm upward toward the incision in the chest wall, pushing upward under the diaphragm, just at the edge of the defect. With the knife in the right hand the margin of the defect was carefully divided, the left hand acting as a support and guard underneath, doing away with any danger of cutting into abdominal viscera. This permitted the easy reduction of the loop of bowel. The reduced splenic flexure was then carefully examined and found to recover its color quickly, and was considered to be perfectly safe to replace in the abdomen. The edge of the defect was also examined. The hernia was of the so-called false congenital type. That is to say, there was no sac and the pleura and peritoneum were continuous across the smooth, rounded edges of a hole about 1½ cm. in diameter. The hole was now closed with interrupted sutures of catgut. This closure was also greatly facilitated by having the two incisions. The sutures were placed from above through the thoracic incision, but the left hand was kept in the abdomen supporting the diaphragm from below, so as to bring it well up into the wound, and also acting as a darning ball to prevent the stitches catching any of the abdominal contents. Both the chest and abdominal incisions were then closed without drainage. The patient made an uninterrupted recovery in the same length of time that would be required for any other ordinary abdominal operation. A dry pericardial rub, lasting a few days, and some evidence of pleural thickening did not delay his convalescence.

The case herewith reported has already received passing mention in the literature, being referred to by Jopson in a discussion of the paper by Matthews and Imboden.[4]

To resume the consideration of the best operative attack in cases of diaphragmatic hernia: The abdominal approach has certain definite advantages. It affords necessary knowledge as to the condition of the abdominal viscera and permits the performance of any resections, repairs or suture that may be required by the condition of these viscera. In all cases of hernia which come in with acute intestinal obstruction, and in those traumatic cases in which a missile has traversed the chest and diaphragm and then penetrated the abdomen, it may be considered absolutely essential to explore the abdomen. With these definite features in its favor it has equally definite drawbacks. The dome of the diaphragm is mechanically very inaccessible from below. The reduction of the hernia is rendered difficult not only by this mechanical situation, but also by the suction of the negative pressure in the chest and by possible adhesions within the thorax, and the suturing of the defect presents the unfavorable mechanical features of a closure done on the concave rather than the convex surface of the diaphragm. The thoracic approach alone, has the advantage of a much more immediate access to the site of the trouble and does away with the negative pressure of the pleural cavity, and so makes reduction easier and gives a much better field for suture of the hernial opening. It might be the method of choice in those cases of congenital hernia not acutely obstructed which are diagnosed before operation. Until the present time, however, this has been by far the smallest group of cases which come to operation, the great majority being those with acute obstructive symptoms not diagnosed before operation and those following traumatism. As has just been pointed out, it is particularly in these classes of cases that exploration of the abdomen is so essential. It would be impossible, broadly speaking, to repair or even to recognize serious intraäbdominal lesions through the thoracic incision alone. Without going into numerous case references, it may be said that the literature of diaphragmatic hernia presents ample support for the statements just made.

The combined abdominal and thoracic approach obviously affords all the advantages offered by either method alone. As in the case herewith reported, it greatly facilitates the necessary steps of the operation, and at the same time gives opportunity for a complete inspection of the whole field involved. It was these considerations which led certain French surgeons to advocate the combined operation, notably Berard and Auvray. The latter has reported the use of an incision beginning as a thoracotomy, then continued downward over the anterior abdominal wall, dividing in its course the costal margin, the anterior abdominal wall itself, and the diaphragm down to the opening of the hernia, thus laying the two cavities broadly open by one extensive incision. While the principle of a double approach seems to the present writer to be the proper solution of the difficulties involved, nevertheless this particular application of it impresses one as being entirely too radical in its execution and unnecessarily

damaging to important structures, particularly the costal margin. On the other hand, it does not seem to add a single advantage over the method herewith described, which consists of two simultaneous but separate incisions. As to possible disadvantages of the combined operation of the latter type, it might be urged theoretically that the opening of the chest added the collapse of one lung and possible additional shock to the burden which the patient has to bear. As a matter of fact, if the hernia can be reduced from an abdominal incision alone, the chest will be thereby opened, except in those few cases where there is a congenital hernia with a true sac, because the reduction of the hernia puts the chest cavity in communication with the outer air by way of the hernial defect and the abdominal incision. This is not a mere matter of assumption, but it has been proved by the writer experimentally on dogs, in whom defects in the diaphragm were made, following which there was an immediate inrush of air into the pleural cavity on the side opened. Therefore the objection noted above has no weight. The single remaining additional burden imposed on the patient by the combined operation is the trivial matter of an incision through the chest wall, perhaps with the removal of a piece of rib, which is quite unimportant compared with the advantages gained thereby.

It is not desired to give the impression that the combined approach is original. It has been accorded passing mention by Soresi[5] and others, usually with the implication that it may be employed as a last resort. The purpose of this article is to establish reasons why the simultaneous abdominal and thoracic attack should be considered the standard method of approach in the large majority of cases of diaphragmatic hernia.

SUMMARY

1. Abdominal exploration is essential in the great majority of cases of diaphragmatic hernia.

2. Thoracic approach greatly facilitates the necessary operative steps.

3. The method of choice, therefore, for the routine handling of these cases should be by combined abdominal and thoracic incisions.

4. These incisions are best made separately instead of by the French method of a continuous incision.

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PERFORATION IN UTERO OF A GASTRIC ULCER*

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and
J. Ralston Wells, M.D.
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Gastric ulcer in children before the tenth year is unusual and warrants recording. The literature of the last thirty-five years contains a number of references to gastric ulcer in patients within the first decade of life. A complete summary of those which we have been able to find is as follows: Lockwood 125 cases, Covey 1 case, Skill 5 cases, Fenwick 18 cases, Parkinson 1 case, Welsh 1 case, making a total of 160 cases. During the first year of life there are eight cases recorded, one each by Rillet, Billard, Goodhart, Phelip and Fey, Cade, Lockwood and Rotch.

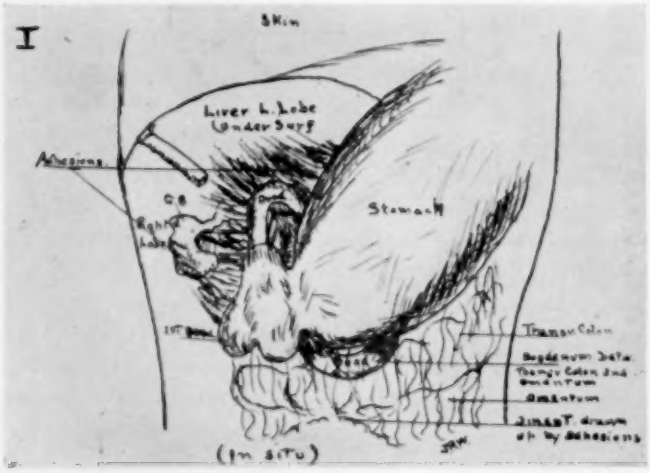

Fig. 1.—Showing organs adjacent to pyloris, bound together by adhesions.

In the group of cases of perforation in the newborn, we can find but two cases aside from the one to be reported. One of Bisset, in an infant forty-eight hours old, and one of Nuzum, who was twenty-four hours old. We are inclined to believe that these two cases do not fall into the class in which we have placed the present one, namely perforation *in utero*, because the two cases alluded to were apparently normal at birth and remained so until there were symptoms of an acute abdominal catastrophe, followed by melena neonatorum or vomitus or both. These symptoms were acute and death rapidly followed in about the time of sequence that the rupture of a hollow viscus usually takes.

Case Report.—The patient, a colored male infant, was born September 8, 1922, and admitted to Children's Hospital when ten days old. Though his twin brother had been perfectly normal (and has had no illnesses up to the time of reporting this case, January, 1923) our patient had exhibited symptoms of pyloric obstructions from birth. The mother had previously borne a normal boy and a

* Read before the Philadelphia Academy of Surgery, January 8, 1923.

girl, who are now living, and has had one miscarriage. The birth of the twins presented no unusual difficulties.

From the very first the patient vomited immediately after taking fluid. This vomiting was at times projectile but usually regurgitant. The vomitus itself was "foamy" and of a greenish color. The parents reported several bowel movements consisting of yellow and green fecal matter. Urination had been normal. No history could be obtained of convulsions or any abdominal catastrophe as might be evidenced by acute abdominal pain and distention, nor could any history be obtained of bloody vomitus or melena.

Physical examination showed a small, fairly well nourished male negro baby ten days old. The skin was copper colored, dry and wrinkled as if from the loss of weight or fluid. The child presented the appearance of dehydration. The head, chest, genitalia and extremities were apparently normal. The abdomen showed folds of skin about the groins and had the appearance of dehydration. There was a small umbilical hernia. Liver and spleen not palpable. No rigidity or tenderness. It was not possible to demonstrate peristaltic gastric waves or palpate any mass in the right hypochondrium. Impression, pyloric stenosis or high duodenal obstruction.

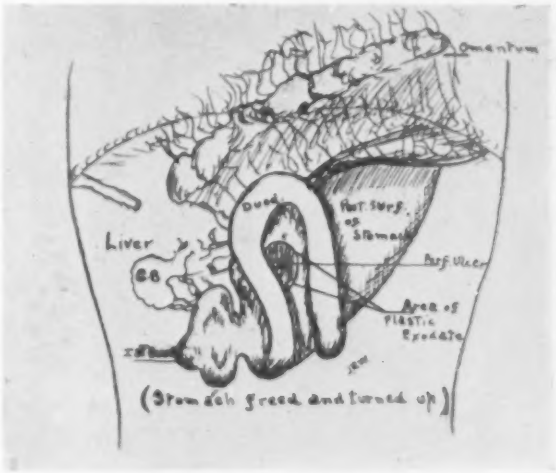

FIG. 2.—Showing opening in wall of stomach, brought into view by separating adherent omentum.

Abstract of clinical notes previous to operation. While in the hospital the temperature range was erratic, from 96 to 100.4. The pulse varied from 100 to 144. Respirations from 28 to 52. There was apparently no relation between these variations. There were two bowel movements during the first four days in the hospital, both following enteroclysis. They were partly formed and dark green in color. On the day of operation there was a small yellow-green stool. He vomited from one to five times during each twenty-four hours before operation.

Patient was admitted to the medical service and was fed with mixtures composed of skim milk, farina and wine whey in various combinations. He lost weight steadily, falling from 4 pounds 9 ounces, to 4 pounds 4 ounces on the day of operation. Urine normal except for a faint trace of albumen and a few hyaline casts. Vomitus was acid in reaction and contained no bile or blood. The stomach contents after lavage contained bile.

Röntgenological report.—On September 21, 1922, he was given a barium meal. Six hours later no barium had passed into duodenum and after twenty-two hours only a very small portion had passed through the pylorus. Diagnosis.—A very definite obstruction at the pylorus.

Operation.—Under ether anæsthesia the abdomen was opened through a right upper rectus incision 6 cm. long. The pylorus was found lying very deep in the hepatic fossa and it was exposed with difficulty. Adherent to the pylorus and to the greater curvature of the stomach there was a section of small intestine,

which upon separation of the adhesions, was found to be the distal portion of a very long duodenum. When these two long limbs of the U-shaped duodenum were finally separated the flexure or knee, corresponding to the second portion of the duodenum, was found to be adherent to the under surface of the liver and gall-bladder. These adhesions were strong, well organized and separated with difficulty owing to their density. They were practically avascular. Following the release of this duodenal obstruction the distal portion was seen to fill and distend with contents expressed from the stomach. The stomach was then more carefully examined and a circular constriction was found about 2 cm. from the pylorus which presented the appearance of an hour-glass contracture. The wound was closed by layer sutures and the child's condition was very satisfactory when he left the operating room. He continued to do well post-operatively except for shallow breathing and lack of vitality. There was one stool subsequent to operation which contained yellow-green feces. There was no vomiting after operation until probably just before death, during the twelfth hour, when the nurse found the child moribund.

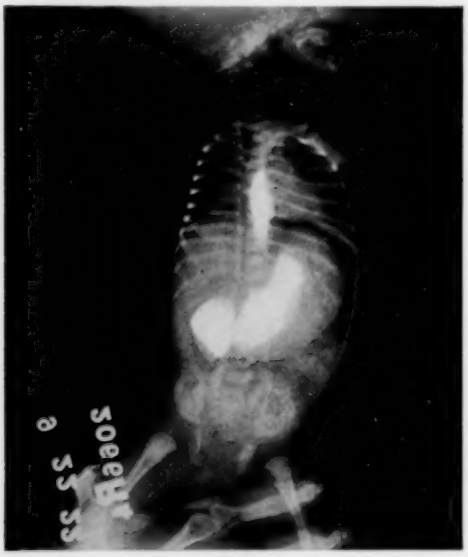

FIG. 3.—Showing distinct hour-glass contracture and position of dense band of connective tissue.

Autopsy.—Performed by enlarging the operative incision. Intra-abdominal palpation failed to reveal any abnormality except in the right upper quadrant. The entire region surrounding the pylorus was a mass of adhesions in which all the organs seemed bound together. These adhesions were very strong, dense and fibrous. There were no so-called fresh adhesions. Before cutting any of these fibrous bands a survey revealed the pylorus and the hour-glass contraction pulled down, back and beneath the inferior surface of the right lobe of the liver. A small portion of the duodenum was seen protruding below the stomach in this region. Pressure upon the stomach showed that the operative mobilization had been complete in relieving the obstruction, for air could be freely forced from the stomach into the lower gut. Upon raising the left lobe of the liver the stomach and first portion of the duodenum were exposed more freely. Dense adhesions were found between the gall-bladder, the under surface of the liver, the duodenum and the stomach, and the posterior wall of the stomach was distinctly involved in these adhesions. Upon separating these and cutting several of the fibrous bands the posterior surface of the stomach was exposed.

The two limbs of the duodenal loop were firmly adherent to the posterior surface of the pyloric antrum. Between these two limbs and well down towards the greater curvature of the stomach, partially covered by the one nearest to the pylorus, was a dense patch of flat, yellowish oval shaped tissue measuring 2 x 2.5 cm. By accident the edge of this patch was raised and finding that it stripped easily from the stomach it was removed and a small perfectly rounded hole in the stomach wall was revealed. The peritoneal edges of this hole were inverted. There appeared to be no inflammatory reaction in the lesser peritoneal cavity

in this region. Pressure on the stomach caused several bubbles to emerge from this perforation. A probe carefully inserted through the hole proved the lesion to be a complete perforation of the stomach wall, it measured several millimeters in diameter. A section of the stomach wall containing the perforation was removed and again the absence of active inflammation about this area was especially noted. The interior of the stomach failed to reveal any other lesions except a very dense mass of indurated tissue in the stomach wall at the site of the circular contraction of the pyloric antrum, but there was no ulceration seen in this area. The described perforation was approximately 4 cm. from the pylorus and was situated upon the posterior wall of the stomach near the greater curvature. There

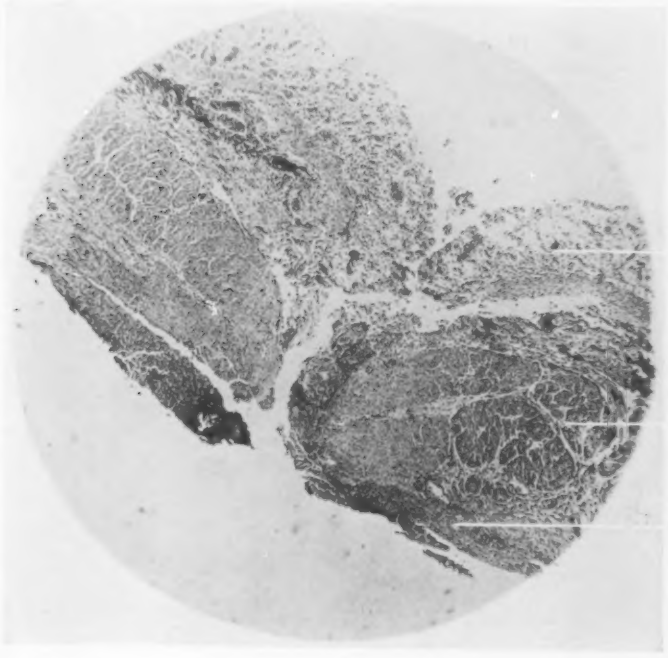

FIG. 4.—Low-power view of perforation.

were no evidences of peritonitis in the lesser or greater peritoneal cavities. There were no evidences of free blood in the stomach or intestines.

Microscopical Examination.—Section shows a strip of muscular and mucous membrane covered on one side by a split-up fibro-cellular zone upon which is a recent fibrino-purulent exudate. The muscular band is fairly well preserved although somewhat split by œdema. The submucous zone is distinctly hemorrhagic. Mucous membrane is hemorrhagic, lacking in fully formed tubules, while many epithelial cells are degenerated and absent from near the surface. The whole strand shows a defect or solution of continuity running from mucous surface to the exudate mentioned above as lying on the outer side. This defect is partly bridged over by a fibrinous exudate and by a piece of necrotic muscle; remnants of glands may be seen near it as if displaced from the mucous to the muscular layer. The edges of the mucosa proper at the point of defect are turned in somewhat but do not show distinct ulcerative-tissue reaction or marked round-cell infiltration. Diagnosis.—Rupture of a part of the intestinal tract, probably stomach, with fibro-purulent peritonitis.

Discussion.—Our case was apparently suffering from gastric or intestinal obstruction at the time of birth which became gradually worse until the tenth day of life. At the time of admission to the hospital all the symptoms of pyloric obstruction were present. Contrary to Holt's broad statement that the only symptom of gastric ulcer in children is hemorrhage, our case gave no symptoms of melena or bloody vomitus. In fact, there were no symptoms of gastric ulcer or perforation before operation nor was the diagnosis made at operation, so perfectly had nature taken care of the situation.

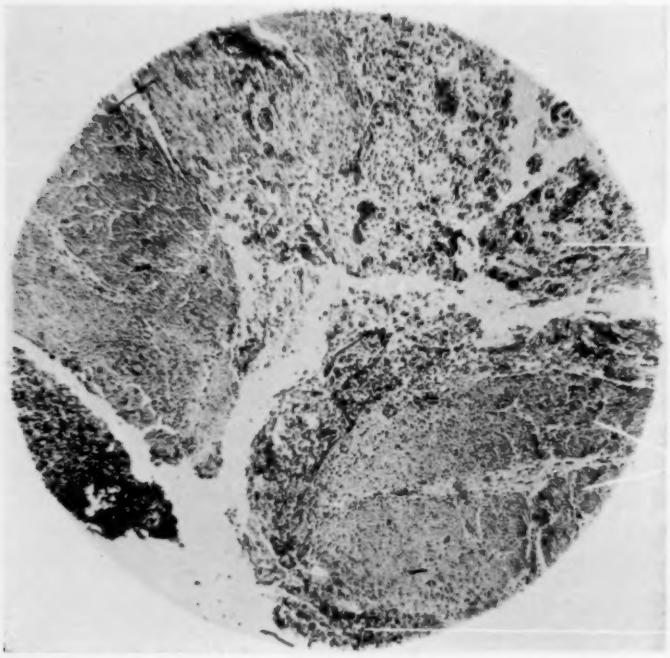

FIG. 5.—High-power of Fig. 4.

We submit the following reasons for our diagnosis of perforation *in utero*. (*a*) Unless an acute gastric ulcer occupies but a matter of a few hours from its start to perforation, we may safely assume that the two cases of Bisset and Nuzum developed their gastric ulcers *in utero*. Both of these cases were apparently normal for a number of hours after birth, when symptoms of an acute abdominal catastrophe were followed by peritonitis. These conditions were entirely absent in our case.

(*b*) Though intra-abdominal adhesions may form in a few hours under these conditions, they are friable, vascular and of the consistency of cobwebs. In our case the adhesions showed a degree of firmness and density and a vascularity that is seen in a stage far later than that of acute inflammation. The age of these bands was certainly several weeks antedating the child's birth. The cause of these adhesions, the perforated ulcer, antedated the adhesions.

(*c*) When we consider that after birth the stomach and intestines are distended for the first time with food, is it not reasonable to think that if this perforation had occurred after birth such gastric contents escaping into the peritoneal cavity would have given acute signs of a general or at least a localized peritonitis? As our patient exhibited no signs even remotely suggestive of an acute inflammatory abdominal condition, nor any pathology of such a process, we feel that the effective plugging of the perforation by a mild chemical reaction of the gastric secretion took place before the stomach contents were infected. The stomach before birth is naturally sterile and contains slightly acid secretion and this could well have set up an acid irritation on the serous surfaces of the lesser peritoneal cavity sufficient to cause adhesions without having a bacterial infection.

(*d*) Many authorities on children's diseases believe that hemorrhage is a constant symptom of gastric ulcer in children. The control of bleeding from such an ulcer is, of course, by the process of thrombosis of the vessels. A close study of the microphotograph will show that several small vessels, surrounding this perforation and in the ulcer area, are filled with plugs of tissue which are probably connective tissue. Some time was required to reach this stage of organization. Again the piece of tissue inverted from the serous surface into the canal is not that of an acutely eroded surface but resembles chronic tissue.

(*e*) The definite hour-glass deformity of the stomach, with infiltration of the stomach wall, would seem to indicate a chronicity of the process which was longer than fifteen days preceding the operation.

(*f*) The fact that the barium meal given on the thirteenth day showed no leakage through the perforation into the lesser peritoneal cavity is evidence that the perforation was closed at this time.

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HÆMANGIOMA OF THE INTESTINE

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Hæmangiomas of the cavernous type are of rare occurrence in the intestines, if one may judge from the small amount of literature on the subject. The majority of text-books on pathology mention the possibility of angiomas occurring in the intestine, but give no details. Ohkuba, whose two cases occurred in a group of less than a hundred consecutive necropsies, believes that the condition is present more frequently than is generally recognized. Among more than five hundred necropsies performed at the University of Virginia Hospital, one case of hæmangioma of the intestine has been observed.

CASE REPORT

Clinical History.—The patient, a female mulatto, seventy-two years old, entered the University of Virginia Hospital, November 4, 1916, suffering from a dislocated shoulder. The dislocation was reduced and the patient, who was feeble-minded, seemed to be doing fairly well. She had been suffering for some time before admission from shortness of breath and swelling of the ankles. Just before death she developed a cough. There had been no gastro-intestinal symptoms except a mild diarrhœa.

Necropsy. No. 239.—The body is that of a mulatto woman, 165 cm. in length, apparently normally developed and well nourished. There is œdema of the feet and ankles. The abdomen is not distended. Enlarged glands are palpable in the inguinal region, axillæ, and neck. The left lobe of the thyroid is enlarged. There is a small amount of serous fluid in the pleural cavity. The lungs are bound down by dense adhesions. On removal of the lungs a frothy fluid escapes from the bronchi. The heart is enlarged. The myocardium is thin and pale and there is sclerosis of all the valves. There is a small amount of serous fluid in the abdominal cavity. The liver and spleen are somewhat enlarged and they show the picture of chronic passive congestion. The kidneys show the changes of chronic nephritis.

Situated on the jejunum, 27 cm. from the pylorus, is a pedunculated mass, 5 x 4 x 4 cm. This tumor is attached to the external surface of the intestine near the mesenteric border. It has for the most part the color of venous blood, but scattered over it are numerous hard whitish areas. These resistant areas alternate with soft cystic regions of purple color. The peritoneal covering of the tumor is smooth and glistening. Upon opening the intestine it is seen that the mucous membrane is not involved. On gross section the tumor is found to be cystic. It contains a brownish fluid and a small amount of grumous material. The tumor is definitely encapsulated by a fibrous envelope which varies from 1 to 5 mm. in thickness. The thickened portions are white and tough while the thin portions are of the color of old blood. The central part of the tumor mass is spongy and irregular in structure. There are several large sinuses just under the capsule. (Fig. 1.)

Microscopic examination of a section of this tumor shows large, irregular, endothelial-lined spaces containing erythroplastids. These blood spaces are

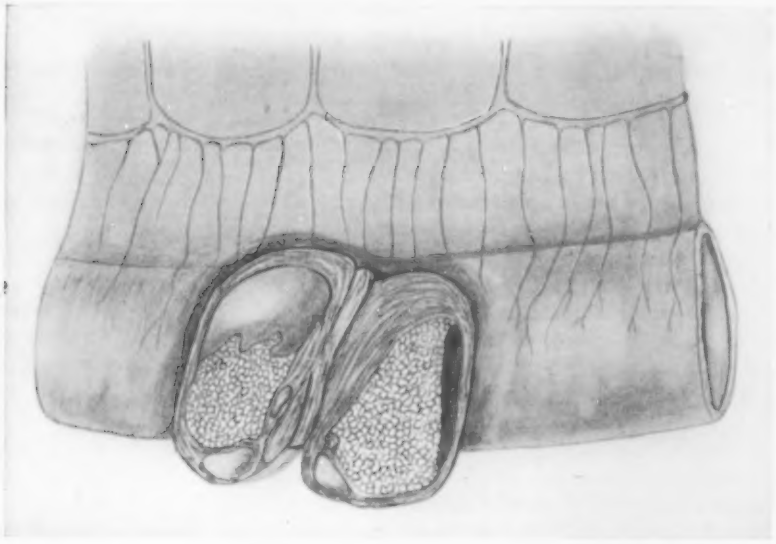

FIG. 1.—Drawing representing a portion of the jejunum including the hæmangioma. The tumor has been sectioned and spread apart to show the interior. The capsule is thick and fibrous. Immediately under the capsule are several various-sized smooth-walled sinuses. One of the sinuses in the half of the angioma to the right contains a thrombus. The central portion of the tumor is of a granular sponge-like structure.

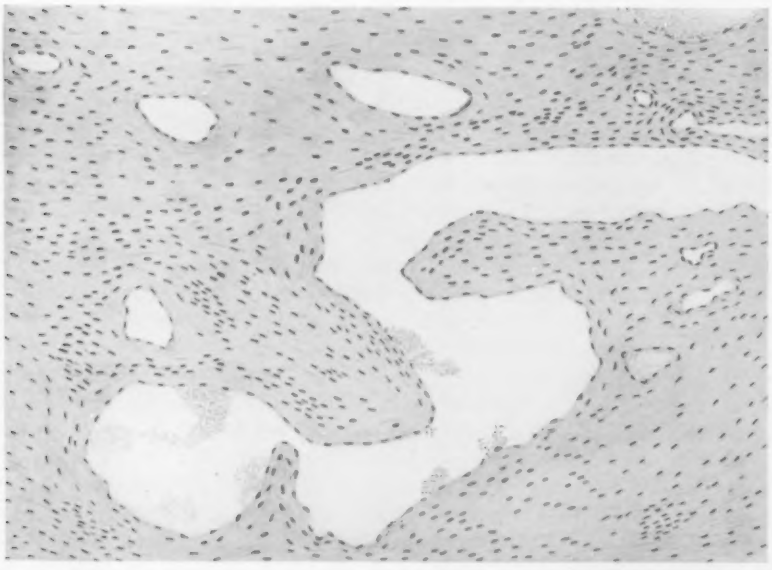

FIG. 2.—Drawing of microscopic section through a portion of the more fibrous part of the tumor; The area includes several large irregular spaces lined with endothelium and containing red blood-corpuscles. The stroma surrounding these blood spaces is composed of dense fibrous connective tissue.

separated from each other by a dense connective tissue stroma. The picture gives the impression of a cavernous hæmangioma which is undergoing retrogression. (Fig. 2.)

The following is a brief summary of fourteen cases of hæmangioma of the intestine appearing in literature:

Gascoyen[1] records the case of a man, aged forty-four years, with numerous nevi in the serosa of the intestine.

Laboulbene[2] reports a case of erectile tumor of the duodenum which gave rise to fatal hemorrhage. The patient, a man aged sixty-four years, had suffered from slight constipation for several years. One morning he passed some blood at stool, and this was repeated for several days. One month later he vomited a large quantity of black coagulated blood, and again passed blood at stool. After a few days his condition again appeared normal. The case was regarded as one of duodenal ulcer. Several days later there occurred extensive hemorrhage from the bowel, following which the patient died. At necropsy the intestine was found to be filled with blood. In the duodenum above the papilla of Vater there was an elevated tumor about the size of an almond. This structure was covered by mucosa except for a ragged ulceration which laid bare the tumor tissue. The growth was composed of greatly dilated capillary spaces.

Boyer[3] describes the case of a man, aged sixty-two years, who at necropsy showed numerous varices in the jejunum and upper part of the ileum. These were rounded blackish nodules which were visible by transmitted light. The largest nodules were the size of a pea, but the majority of them were much smaller. They were closely aggregated throughout the submucosa. No alteration of the large arteries or veins could be discerned, but when examined with a lens, these nodules appeared to be situated upon arterial loops, and to be themselves formed of vascular loops like a renal glomerulus. The nodules were fairly sharply outlined, and the walls of the capilliform vessels, which were twisted together to form the nodules, were parallel to each other and in continuity with the arterioles. Each nodule was surrounded by a connective tissue envelope.

Paci[4] reports a case of a woman who had suffered for a short time with symptoms of intestinal obstruction. Suddenly she passed, along with feces, a mass of tissue which was recognized as a pedunculated cavernous tumor. The central portion of the tumor was composed of cavernous tissue, with large lacunæ filled with clotted blood. Numerous capillaries occurred in the trabeculæ, and the whole was covered with mucosa. Hemorrhage had occurred into the substance of the tumor, enlarging it to such an extent as to cause obstruction. Subsequently the tumor had been torn from its peduncle and passed from the bowel. Thus the obstruction was relieved at once.

Nicoll[5] reports the case of a young woman, aged twenty-three years, who suffered from symptoms of acute intestinal obstruction. The patient had had a similar attack two weeks previously and during the fortnight she had had pain in the epigastrium, coming on shortly after meals, and lasting for about an hour. At operation a double intussusception, involving over five feet of bowel, was discovered. Unable to reduce the intussusception, Nicoll resected the intestine. Upon opening the involved bowel he found a tumor about the size of a pigeon's egg. The tumor consisted of large thin-walled spaces filled with coagulated blood and it was typically nevoid. It contained two small phleboliths, each the size of a split pea. One of its surfaces was covered with peritoneum, and the other, the internal surface, with villous mucous membrane.

Hektoen[6] records a case of endocarditis in which there were many large veins under the intestinal mucosa resembling varicose veins. These vessels occasionally

anastomosed and overlapped. They occupied a limited portion of the small intestine, and sometimes presented globular dilatations filled with blood. Microscopically they proved to be dilated venules, and Hektoen speaks of the condition as a simple hæmangioma.

MacCallum[7] describes the case of a white man, aged fifty-four years, who had had digestive disturbances for months. Two years prior to admission to the hospital the patient had vomited a quantity of blood. At necropsy the small intestine was normal throughout, as far as the mucosa was concerned; but throughout its length, especially in its upper portions, there could be palpated either from the peritoneal side or from the luminal side small fairly firm areas. These areas were visible through the mucosa as blackish purplish patches, the largest of which reached a diameter of 7 to 8 mm. By transmitted light they appeared as dark red, thick nodules situated along the course of the veins, and connected by abundant branches with the larger veins. Microscopic sections showed that these areas were vascular tumors of cavernous structure composed of wide sinus-like spaces lined by endothelium and filled with blood. The structures were entirely in the submucosa.

Bennecke[8] reports the case of a man fifty-two years old, who died of tuberculous meningitis. In the small intestine were found many small brownish-red masses. These masses were moderately firm, irregular and covered with mucous membrane. They were situated entirely in the submucosa, and occurred in the stomach and œsophagus as well as in the small intestine. Microscopically these masses consisted of a communicating system of cavities partly filled with blood. This system of cavities was intimately connected with the neighboring vein.

Ohkuba[9] reports two cases of intestinal angiomas. His first case occurred in a woman, sixty-six years old, who died of pneumonia. The wall of the entire intestine was pale and, with the exception of innumerable varices in the submucosa of the jejunum, showed no pathologic change. The second case occurred in a man, seventy-nine years old, who died with a terminal pneumonia. In the submucosa of the entire small intestine were numerous, scattered, pea-sized, varicose nodules. Ohkuba considers the lesions in these two cases the same. The nodules were situated in the submucosa and projected slightly into the lumen of the intestine. There was no change in the mucosa covering the nodules. Viewed by transmitted light the nodules appeared dark red in color, irregularly formed and attached to the vein. Under the microscope these structures were seen to be composed of irregular communicating cavities lined with endothelium. Ohkuba regards these nodules as true cavernous angioma.

Tuffier[10] describes a case of angioma of the sigmoid in a man thirty-one years of age, which gave rise to fatal hemorrhage. Intestinal hemorrhages appeared at the age of seven years, associated with tenesmus and the passage of about a tumbler full of bright red blood. These hemorrhages continued at intervals of months or years until the patient's death. Rest in bed would usually relieve the patient and he would be able to resume his work. He became very anemic and his condition was considered to be one of pernicious anemia. When the patient came to Tuffier, the latter did a sigmoidoscopy and found situated, 22 cm. above the anus, a small purplish tumefaction about the size of a pea. This was slightly ulcerated. At the level of this mass were some little nodular areas which had the appearance of naevi. This ulcerated area was considered to be the site of the hemorrhage and was accordingly cauterized. The patient recovered to a certain extent, but later the hemorrhages recurred. A laparotomy was performed but no tumor discovered. The patient died and at necropsy, at the level of the flexure of the sigmoid, two small angiomas were discovered. These structures were small red masses about the size of a pea, and were situated in the submucosa. No ulceration was apparent.

Hartmann[11], in a discussion of Tuffier's paper, cited a case of angioma of the rectum which had occurred in his own practice. The patient, a woman twenty-two years old, had been referred to Hartmann for bleeding hemorrhoids. Blood in this case, however, preceded the stool, which is not the case in hemorrhoids. Proctoscopy revealed a small angioma. Cure followed electric cauterization of this tumor.

Dujarier and Topous Khan[12] record a case of a man who had been having rectal hemorrhages intermittently for three years. He has become very anemic and emaciated. An exploratory laparotomy revealed a number of cavernous angiomas of the sigmoid, associated with marked varicosities of the veins.

Judd and Rankin[13] report a case of hæmangioma of the duodenum in a woman twenty-two years old, which caused chronic obstruction. The patient had had chronic dyspepsia since childhood. Any dietary indiscretion caused nausea and epigastric distress. Recently she had had severe abdominal pain. Röntgen-ray examination showed a shadow in the duodenum. At operation a thick walled dilated stomach was found, and in the duodenum was a rounded tumor completely filling the lumen. The tumor, which was 3 cm. in diameter, was excised. It proved to be a cavernous hæmangioma.

In the wall of the intestine there are three plexuses of blood-vessels: a subserous plexus, an intramuscular plexus, and a submucous plexus (Jordan[14]). Angioma may arise in any one of these plexuses. The submucous plexus is the most extensive, and it is in the submucosa that the majority of hæmangiomas occur. The case reported here is an example of an angioma arising in the subserosa; while the case of Nicoll, in which the angioma had a covering both of mucosa and serosa, might have had its origin in the intramuscular plexus.

Angiomas of the intestine may be divided into two classes: simple and cavernous. To the class of simple angiomas belong the cases of Gascoyen, Boyer and Hektoen. The cavernous angiomas may be either multiple or solitary. The four cases of multiple angiomas (MacCallum, Bennecke, and Ohkuba) are very similar. These lesions all occurred in individuals of advanced age. The tumors were situated for the most part in the jejunum and upper ileum, were of small size, and showed a definite relation to the veins of the submucosa. With the possible exception of the case reported by MacCallum these growths gave no symptoms.

In the majority of cases the tumor occurs in the small intestine, most frequently in the upper portion. Tuffier, Hartmann, and Dujarier and Topous Khan report cases of angiomas occurring in the sigmoid and rectum.

Hemorrhage occurred in four, or 28.6 per cent., of the fourteen cases I have been able to collect. In two of the cases the hemorrhage proved fatal. If the tumor is situated in the sigmoid or rectum, and is the seat of hemorrhage, the clinical picture may be confused with that produced by hemorrhage from hemorrhoids. If bleeding occurs from an angioma in the small intestine the clinical picture may simulate that of duodenal ulcer. There is a possibility that an angioma situated under the serosa might give rise to intra-abdominal hemorrhage.

The angiomas caused intestinal obstruction in three cases (21.4 per cent.). In two of these cases the symptoms were acute. In one case obstruction was due to the size of the tumor; in another case obstruction was due to intussusception caused by the tumor. The third case gave symptoms of chronic obstruction.

Hæmangiomas situated in the rectum or lower sigmoid may be successfully treated by cauterization. In the small intestine the angiomas, especially of the solitary type, are readily removed by excision. Judd and Rankin remark on the splendid results obtained by operative surgery in these cases.

SUMMARY

1. Hæmangiomas may occur in the intestinal submucosa, between the circular and longitudinal muscle layers, or under the serosa. The angiomas may be either simple or cavernous in type. The cavernous angiomas may be either solitary or multiple. Most angiomas arise in the submucosa.

2. Angiomas may give rise to intestinal or intra-abdominal hemorrhage, or to intestinal obstruction. Obstruction may be due to the size of the tumor or to intussusception. Hemorrhage from an angioma situated high up in the small intestine may be confused clinically with bleeding from a duodenal ulcer. Bleeding from an angioma of the sigmoid or rectum may simulate hemorrhoids.

3. These tumors may be either cauterized or excised with good results.

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FURTHER OBSERVATIONS ON A MODIFIED INGUINAL HERNIOPLASTY TECHNIC, WITH COMPLETED UTILIZATION OF THE APONEUROSIS OF THE EXTERNAL OBLIQUE*

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In 1920, under the title "Modified Technic for the Radical Cure of Inguinal Hernia in the Male," [1] I reported on a modification of the Bassini-Andrews hernioplasty technic, the essential principle of which was the complete utilization, without mutilation or distortion, of all the useful, available structures for the actual repair of the hernial orifice, by the overlapping beneath the transplanted cord and over the Bassini suture line of the external oblique aponeurosis. Schley,[2] in a paper, which immediately followed mine, supported these suggestions by the recommendation of a very similar procedure, and in a discussion on hernia at the May 12, 1920, meeting of the New York Surgical Society,[3] several of the speakers, notably Woolsey, advocated the principle involved and stated that they had been using methods based fundamentally upon the same idea.

It is not my present intention to describe again in detail the development of this modification or to reiterate the various technical points involved, but rather to give a brief summary of some of my observations and experiences since the publication of my former paper, and to consider and answer some of the objections that have been raised against the suggested technic. In certain particulars the views as first expressed have been slightly altered or modified, yet, notwithstanding the criticisms advanced, the conclusions today, I believe, only strengthen the contention originally made that the method insures the maximum guarantee against recurrence, offers the greatest possible factors of safety, and is especially applicable in direct, large indirect and recurrent herniæ, particularly in the more complicated varieties, in sliding herniæ, and in cases where the development of the internal oblique muscle and conjoined tendon is defective or where Poupart's ligament is thin or tears easily, as in elderly subjects, with old, truss-abused herniæ. It should here be observed that the results with this method do not seem to be noticeably influenced by the patient's age, and therefore, I cannot quite subscribe to a recent statement of Pool's[4] that, owing to the frequency of recurrence, operation is not considered advisable in patients over fifty-five years of age unless there are strong indications.

Before approaching the more technical questions, I would like to say a few words in further support of local anæsthesia. The past three years have but confirmed my belief that, for the average hernia case, local anæsthesia

* Read before the Philadelphia Academy of Surgery, March 5, 1923.

with one-half per cent. novocain-suprarenin solution is the anæsthesia of choice. In addition to the usual Braun injection, I believe it advisable to complete the subcutaneous and subaponeurotic rhomboid from points above and below Poupart's and then to infiltrate the skin in the line of incision. This latter procedure will obviate the delay of waiting ten to fifteen minutes for the conduction anæsthesia to take effect. When the external oblique aponeurosis has been incised and the cord exposed, the direct nerve injection, as high up as possible, of the inguinal branch of the ilioinguinal, the hypogastric branch

FIG. 1.—External oblique aponeurosis has been split. Large direct sac and small indirect sac are seen on either side of epigastric vessels.

of the iliohypogastric, if seen, and the genital branch of the genitocrural, is most helpful. This is further supplemented by a circular injection of the peritoneum at the neck of the sac, anæsthetizing that region which is not affected by the usual injection. When an appendectomy is done in conjunction with a right-sided hernioplasty, a few whiffs of nitrous oxide may be useful during the locating, delivery and removal of the appendix. Aside from the diminished risk, there is no question but that the post-operative recovery as to pulmonary complications, vomiting, etc., is much less stormy after local anæsthesia, and the various objections offered, such as interference with primary union, increased tendency to recurrence, or femoral phlebitis, I have not noted. Serous accumulations or wound hæmatomata may be a trifle more

prevalent, but can be avoided by painstaking hæmostasis, not too close skin sutures, or temporary skin drainage in indicated instances. The fact that the patient is conscious and can cough to demonstrate the sac or to test the suture line is frequently most advantageous. It is true that the mental strain on the surgeon is greater when the patient is awake, but this is a purely subjective matter and is entirely overcome by sufficient schooling. The claim that local anæsthesia takes too much time and is more trouble to the surgeon is an indirect admission of its superiority.

Regarding the actual technical procedure, I wish to emphasize certain important points and to call attention to certain minor changes that have been

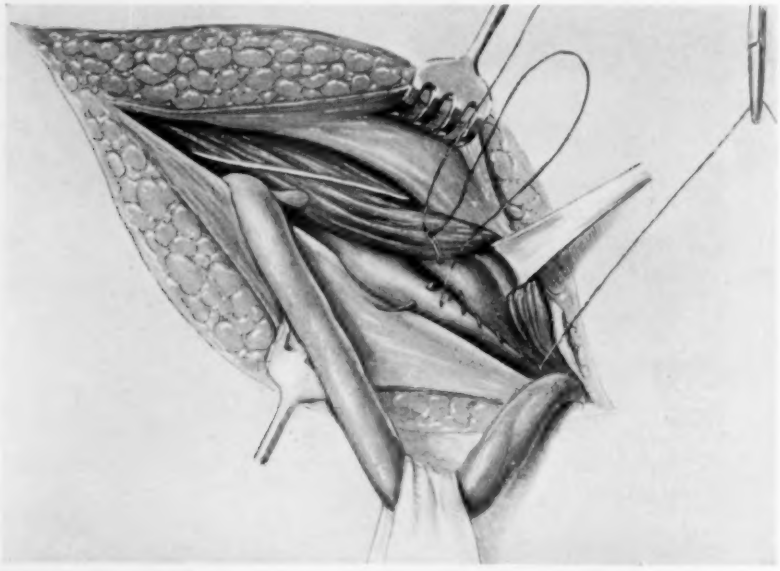

FIG. 2.—Direct sac with transversalis fascia covering is being inverted by continuous suture. Indirect sac has been dissected away and stripped from cord.

suggested by experience and adopted to simplify and to improve the operation. The vital feature of the modified technic is the use of the entire external oblique aponeurosis for the actual hernial repair, instead of for the ineffective, superfluous, and not infrequently injurious covering of the cord. It further insures a solid fascia to fascia union, and effectually dispels the common criticism of the inadequacy of the muscle to fascia suture line of the typical Bassini operation, although this may in a measure be overcome by catching as much as possible of the tendinous portion of the conjoined tendon. By the overlapping of the lower flap of the aponeurosis on the upper flap, assurance is made doubly sure by a second true fascia to fascia union. A preliminary removal of all the fat, covering muscle or aponeurosis, before the suturing is begun is extremely important to establish direct approximation.

The transplantation of the rectus muscle or of a flap from the anterior sheath of the rectus, I have found may be entirely dispensed with, even in the

most unfavorable cases. In spite of the fact that many surgeons have recommended one or another of these plans to assist in the closure of large defects, they have always appeared to me as unphysiological and unanatomical distortions. The use of the external oblique aponeurosis in the manner advocated also does away with the need of a free fascial transplant which, even if it takes, becomes to a certain extent replaced by scar tissue and is in no way comparable

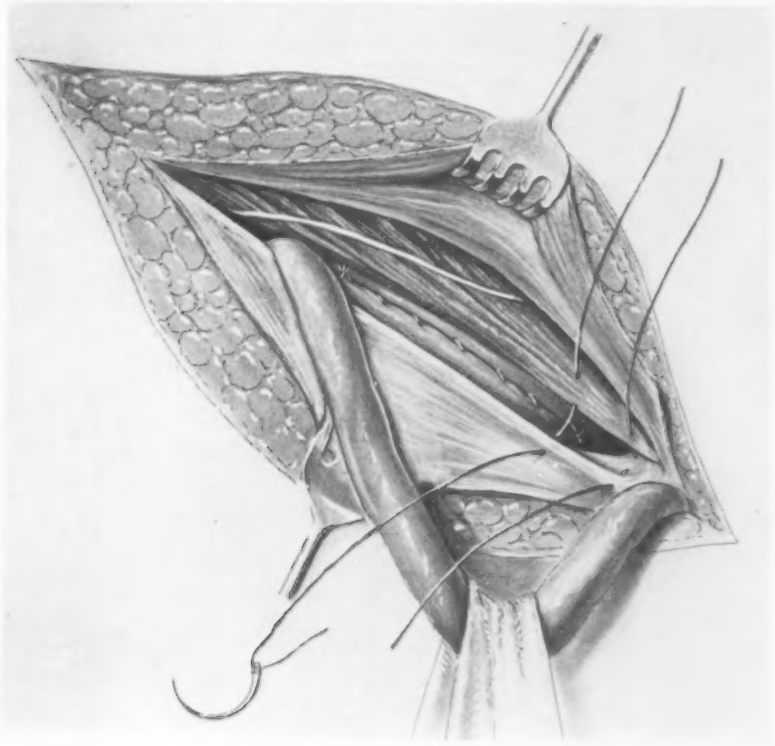

FIG. 3.—Inversion suture of direct sac with transversalis fascia covering has been completed and indirect sac has been pushed back. Medial angle of interrupted suture of internal oblique muscle and conjoined tendon to Poupart's ligament has been begun, with first or most medial suture including part of Gimbernat's ligament and second suture catching muscle and tendon flatly near edge.

to an attached, nourished and vital aponeurotic flap. As yet, orchidectomy has never been indicated in my experience with the method described.

In a direct hernia, if the sac is large, it is partially resected, but if small, it is merely replaced. In either case, a continuous No. 1 chromic catgut suture of the transversalis fascia covering the sac, beginning at the medial angle, is a most useful preliminary to the true hernioplasty, making really a quadruple, instead of a triple, suture line over the defect (Figs. 1 and 2). In many instances, especially in old herniæ, the transversalis fascia is distinctly thickened, and its suture alone holds back the protrusion and practically cures the hernia, as I have often demonstrated, by permitting the patient to cough or strain, before beginning the first true hernioplasty suture of the internal

oblique muscle and conjoined tendon to Poupart's. When the cord is drawn out, a small indirect sac is often found coëxistent with the direct hernia. This is usually an artifact due to the traction on the cord and it is merely dissected away from the cord, stripped and pushed back without opening the peritoneal cavity or, if large enough, it is ligated and resected (Figs. 1 and 2). If a typical indirect sac is found, transfixion, ligation and resection must be made as high up as possible, as it is now generally conceded that the proper disposition of the sac is most essential toward the permanent radical cure. The sac is only deliberately opened prior to its removal if it contains

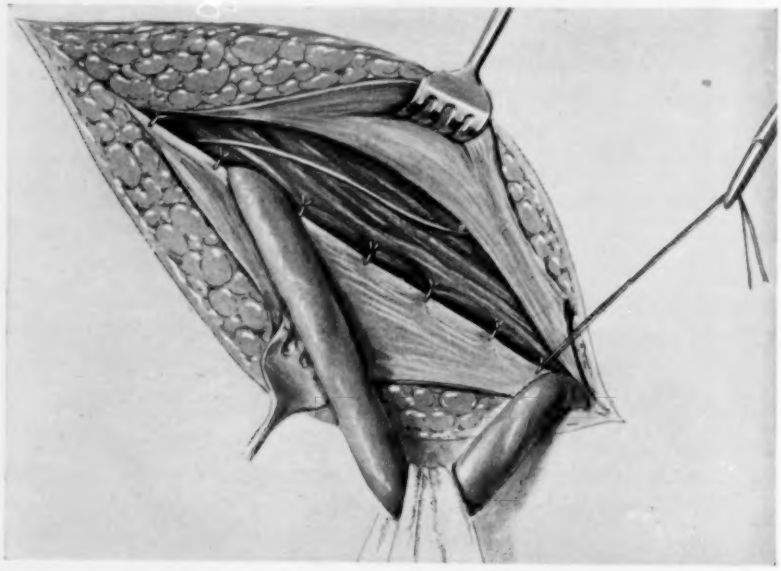

FIG. 4.—Interrupted suture of internal oblique muscle and conjoined tendon to Poupart's ligament has been completed. Edge of muscle and tendon are tucked under ligament. Two sutures, between which inguinal branch of ilioinguinal nerve emerges, are placed lateral to exit of cord. First or most medial suture is left long as guide for next suture layer.

irreducible contents or if, in a right-sided hernia, an appendectomy is to be done. If the ring is very large, the sac is resected and the peritoneal opening closed with a continuous No. 1 chromic catgut suture, which includes the transversalis fascia.

The method of suture has been slightly modified since the first publication. As already stated, a continuous No. 1 chromic catgut suture is used for the transversalis fascia suture, and for closing or inverting the direct sac. Then an interrupted No. 2 chromic catgut suture line is used for the Bassini suture of the internal oblique muscle and conjoined tendon to Poupart's. It is felt now that it is better to commence this suture at the medial angle of the wound and to work toward the internal ring. The skin incision should have been so made in the beginning that the medial angle of the deep wound is well exposed. The first suture should scrape the pubic bone and include part of Gimbernat's ligament (Fig. 3). It should be left long after it is tied as a guide

for the next suture line. The sutures, from four to six in number, should take a substantial bite but should penetrate the muscle and tendon flatly to avoid puncture of the intestine and may be tied as inserted. An effort should be made to insert them in such a way as to tuck the edge of the muscle and tendon beneath Poupart's. Two or three sutures are then placed lateral to the internal ring, beginning with the most lateral (Fig. 4). This method of placing the sutures permits of more discretion in the estimation of how

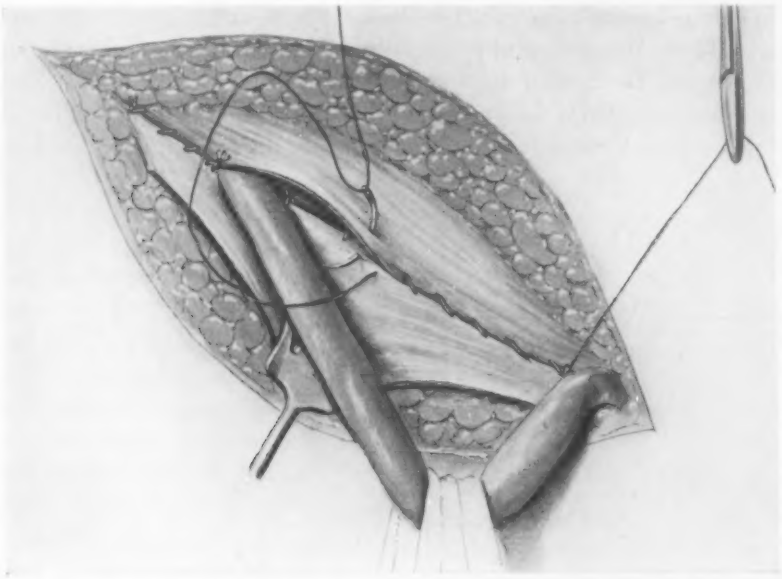

FIG. 5.—Continuous suture of upper flap of external oblique aponeurosis to Poupart's ligament beneath cord and over previous suture line. Suture lateral to cord has been begun at lateral angle and is completed. Suture medial to cord, having been begun at medial angle with end of suture left long as guide for next suture layer, is approaching exit of cord.

close they may approach the ring with impunity. The sutures should not be tied too tightly and the nerves should be retracted out of the way so as not to be included in the stitches.

In the suture of the upper flap of the aponeurosis to Poupart's, two short continuous sutures of No. 1 chromic catgut have been substituted for the interrupted suture, as making a more satisfactory approximation with fewer knots (Fig. 5). The first suture is begun at the lateral angle and runs inward to the ring, while the second suture begins at the medial angle at the spine of the pubis, with the uncut first Bassini suture as a guide, and runs outward to the ring. Two points in regard to both the internal oblique muscle-conjoined tendon and upper flap of the external oblique aponeurosis sutures to Poupart's should here be emphasized. Firstly, the needle entering Poupart's should vary its bite and pierce the ligament between different fibres so as to avoid tearing it. Care, of course, should be taken not to injure the femoral vessels. Secondly, an attempt should be made to displace the internal ring somewhat laterally, but without constriction of the cord. It is even possible

in most instances, especially in connection with the subsequent disposal of the lower flap, to arrange, with absolute safety, a valve-like action, from within the abdomen when the intra-abdominal pressure is increased, of the deviated, but not angulated cord, against the lateral end of the medial suture line (Fig. 6).

Having originally made a liberal lower flap of the external oblique aponeurosis to which damage from retraction has been carefully avoided, its division at a point opposite the exit of the cord, preparatory for its overlapping upon the upper flap beneath the cord, is the next step and a most important one. This should be done carefully, guarding the cord against injury, and the incision should be carried to, but not into, Poupart's ligament (Fig. 7). This division completely avoids kinking, compression, or strangulation of the cord, and I have gradually learned that, as a result of this procedure, one can make a very snug suture around the point of exit of the cord without producing the slightest circulatory disturbance in the testicle. I am convinced that the tightness of the ring can be made considerably greater, and without any risk, than by any method where the cord is covered by the tough aponeurosis, and consequently angulated under a dense fascial layer or in an unyielding fascial tube. This snug closure around the cord may be enhanced by cleaning the cord of lipomatous masses or useless cremasteric fibres, but care should be taken not to abuse or traumatize the cord, or disorganize and damage its important structures. The separation of the cord into two independent strands of vessels and vas deferens, to come out of separate rings, as has been recommended, I do not believe to be a very wise procedure. This disintegration may injure the vessels just enough to interfere with the testicular circulation.

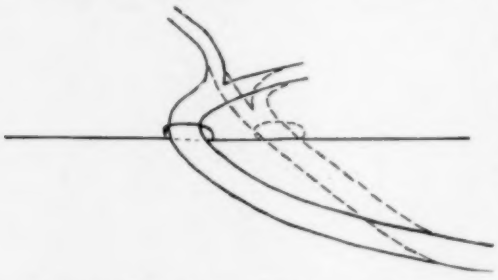

FIG. 6.—Diagram to show deviation of cord and lateral displacement of ring by two previous suture lines. Dotted line shows usual position of cord and ring, solid line shows deviation of cord and lateral displacement of ring.

The fascial division in no way weakens the repair, as the incision is through a point which ordinarily is not utilized for the hernioplasty at all, but merely as a cord covering. The objection that has been raised that the subcutaneous position of the cord is undesirable, can be answered merely by the statement that in my experience I have never yet observed the slightest discomfort or injury to the cord therefrom, and that in any operation for hernia a certain portion of the cord is always subcutaneous anyway, in a place where it is much more subject to trauma than on the aponeurosis, namely at its point of emergence from the external ring near the pubic spine. It has been suggested that damage to the cord because of its superficial position, might result during an operation for recurrence. Although, as yet, I have not had the opportunity to operate on a recurrent case in which this method

had been used, injury to the cord can certainly be avoided if ordinary surgical caution is observed, especially if the type of the previous operation is known. Besides, the argument advanced is rather futile against the performing of an operation that seems most likely to prevent a recurrence and applies likewise in a measure to any other form of hernioplasty. The criticism that, in this operation, the so-called external and internal inguinal rings are superimposed, more or less, in the same anteroposterior plane and that therefore the opening is weaker, I consider purely theoretical, not based upon an understanding of the mechanics of hernia, and disproven by the results obtained.

In the final suture layer of the divided lower flap of the aponeurosis,

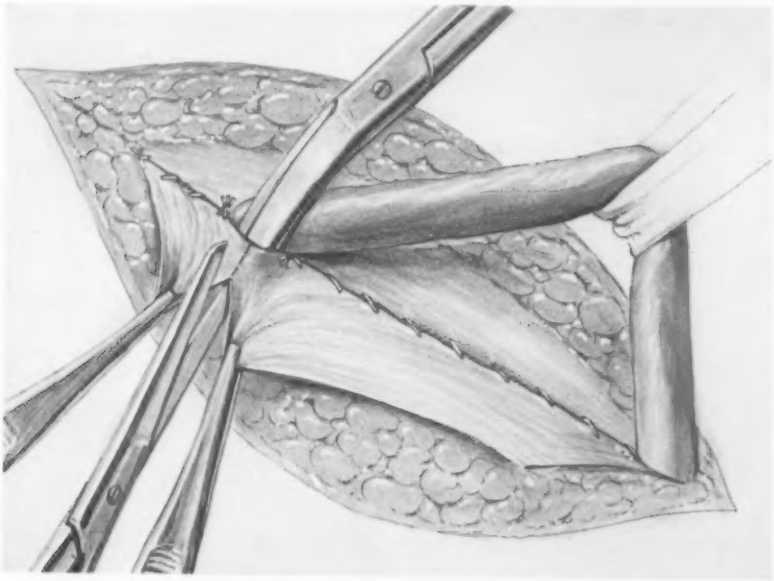

FIG. 7.—Suture of upper flap of aponeurosis has been completed, lateral and medial to exit of cord. Splitting of lower flap of external oblique aponeurosis perpendicularly to its fibres at point opposite exit of cord which is guarded with blunt, curved scissors. Lower flap is divided into smaller lateral and larger medial portions.

overlapped upon the upper flap, again two short continuous sutures of No. 1 chromic catgut have been substituted for the previously used interrupted suture. The first runs from the angle at the point of division of the outer part of the flap to the lateral angle, and the second, from the angle at the point of division of the inner part of the flap to the medial angle. More of an attempt is now being made to bring the two portions of the divided flap together and to surround the exit of the cord as closely as possible, even overlapping them in suitable cases. Finally, two mattress sutures of No. 1 chromic catgut are placed near each free edge of the divided portions of the lower flap, fixing them on the upper flap of the aponeurosis, the lower mattress suture on either side coming close to Poupart's and including almost the free edge of the upper flap (Fig. 8). This manœuvre establishes the most satisfactory ring, which, while tightly surrounding the cord exit, is still perfectly

safe. It will also be noted that in addition to the more extended use of the continuous suture, less heavy suture material has been adopted. This has been done because it is believed that the successful result of the operation depends not upon the character of the suture material or upon the type of the stitch itself, for which reason all obviously objectionable non-absorbable sutures and all complicated stitches are avoided, but upon the most satisfactory union of the tissues. Therefore, it is felt that the less irritation there exists from suture material, knots, etc., the better will this result be accomplished. I do not believe that a suture of the fat or superficial fascia

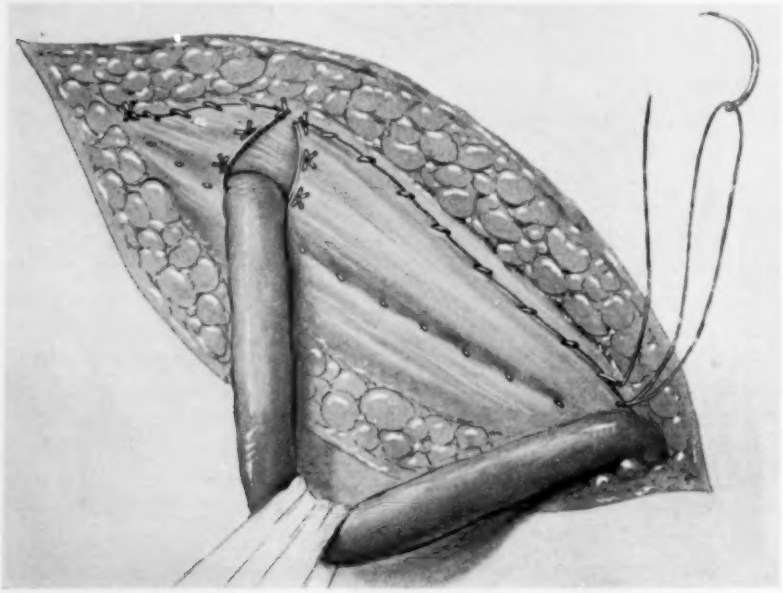

FIG. 8.—Overlapping and continuous suture of two portions of divided lower flap on upper flap of external oblique aponeurosis, with larger, medial portion beneath cord. Lateral portion has been sutured from angle at point of division to lateral angle. Suture of medial portion from angle at point of division to medial angle is just being completed. Two mattress sutures near each free edge of divided portions of lower flap to upper flap. Cord left subcutaneous.

is necessary, or even advisable, in most cases. It tends to enclose the secretions and predisposes to subcutaneous serous or sanguinous accumulations. In such cases where the testicle has been withdrawn from the scrotum during the operation, the superficial fascia and subcutaneous tissue is closed at the scrotal opening with a catgut suture or two in order to prevent the testicle from slipping out of the scrotum on to the abdomen during convalescence. I have once seen such an accident, which was fortunately recognized in time to replace the testicle, happen after an operation for varicocele. This disastrous complication can be further guarded against by leaving the scrotum out of the dressing where it may also be inspected and palpated. It should rest on a small cushion or on adhesive plaster bridge. The skin incision is closed usually by five interrupted silkworm gut sutures, with sufficient interval between them to allow some drainage of serum and blood. In cases where

oozing is feared, as in operations for recurrent or large herniæ, a split rubber tube drain at one or both angles of the incision is used and withdrawn after two to three days.

In cases of femoral hernia the Lotheissen technic is followed through an inguinal incision. After splitting the externai oblique aponeurosis, the sac is drawn into the inguinal canal. It is then transfixed, ligated and resected, or resected and sutured, or merely inverted with a continuous No. 1 chromic catgut suture which also includes the transversalis fascia, and the typical suture of the edge of the conjoined tendon to Cooper's ligament, covering the

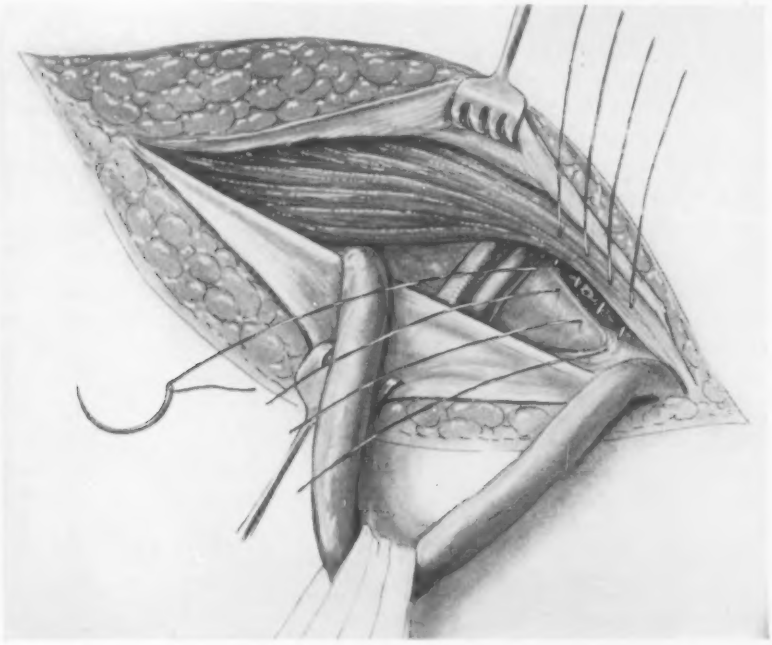

FIG. 9.—Femoral hernia sac has been ligated and resected through inguinal incision after splitting of external oblique aponeurosis. Interrupted sutures of conjoined tendon to Cooper's ligament on iliopectineal line have been inserted from medial angle to vein, with first or most medial suture catching edge of Gimbernat's ligament at its junction with Cooper's.

iliopectineal line, is made as close to the femoral vein as can be safely done, even angulating it a trifle (Fig. 9). Again, one begins at the medial angle, using interrupted No. 2 chromic catgut. The first suture catches the edge of Gimbernat's ligament at its junction with Cooper's. In this case, it is better not to tie the sutures, of which three or four are needed, until all are placed, as otherwise one has difficulty in placing the most lateral suture next to the vein and one may injure the vessel with the needle when inserting same for this last suture. Of course, if there is a typical inguinal hernia in addition, one must continue with the repair of the inguinal canal, but I have always had the feeling that, even if there is no obvious inguinal hernia, this operation, which I believe to be the best for the closure of the femoral canal, leaves a rather weak internal inguinal ring and a predisposition to the develop-

ment of inguinal hernia. Therefore, in every case, with or without an actually developed inguinal hernia, I proceed with a typical inguinal hernioplasty in the manner described above, except that the sutures in the medial half of the first, or Bassini suture line, instead of entering at or near the edge of the internal oblique muscle and conjoined tendon, which has been used for the Lotheissen suture, catches the muscle and tendon about one cm. above the edge and is tied over the Lotheissen suture line (Figs. 10 and 11). This can usually be easily done without the slightest tension. After the inguinal hernioplasty is completed, if possible, a few extra, interrupted No. 2 chromic catgut sutures are placed between Poupart's and the pectineal fascia as in the

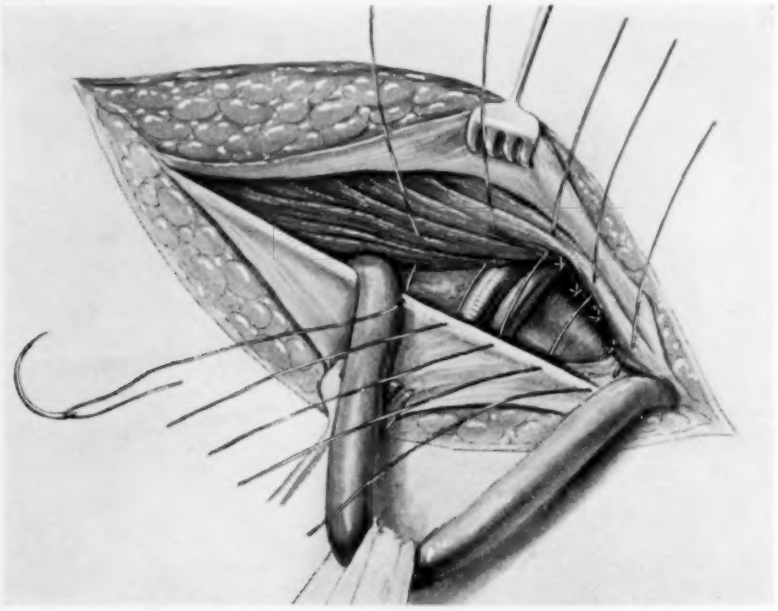

FIG. 10.—Sutures of conjoined tendon to Cooper's ligament have been tied and interrupted sutures of internal oblique muscle and conjoined tendon to Poupart's ligament have been inserted from medial angle to exit of cord as in typical inguinal hernioplasty, except that medial sutures grasp muscle and tendon somewhat above edge.

Bassini femoral hernia operation, to further insure the closure of the femoral canal (Fig. 11).

Very few changes in the after-treatment have been adopted. The bowels are left alone for three or four days, sometimes longer. I do not believe that gas pains are relieved by enemata or colon irrigations. I feel that it is better to handle the tissues gently during the operation and then to leave the paretic intestine alone and permit it to recover its tone without interference. Besides, straining at stool twenty-four or forty-eight hours after the hernioplasty cannot possibly be beneficial to the suture line. A modified Gatch bed is now used to relax the abdominal muscles by slightly sitting up the patient and flexing the thighs for at least a week after the operation, as Lyle [5] has recommended. I have increased somewhat the duration of the patient's stay

in bed, as I believe that too early getting up tends to recurrence. Even in an uncomplicated, unilateral, indirect hernia, I rarely permit the patient out of bed before two weeks, and in complicated, large or bilateral herniæ, I keep him in bed anywhere from sixteen days to three weeks. This is quite in accordance with the idea that complete cicatrization, as shown by experimental investigation, takes fully twenty-one days. Hard physical labor or active exercise should not be resumed for at least four to six weeks after the patient

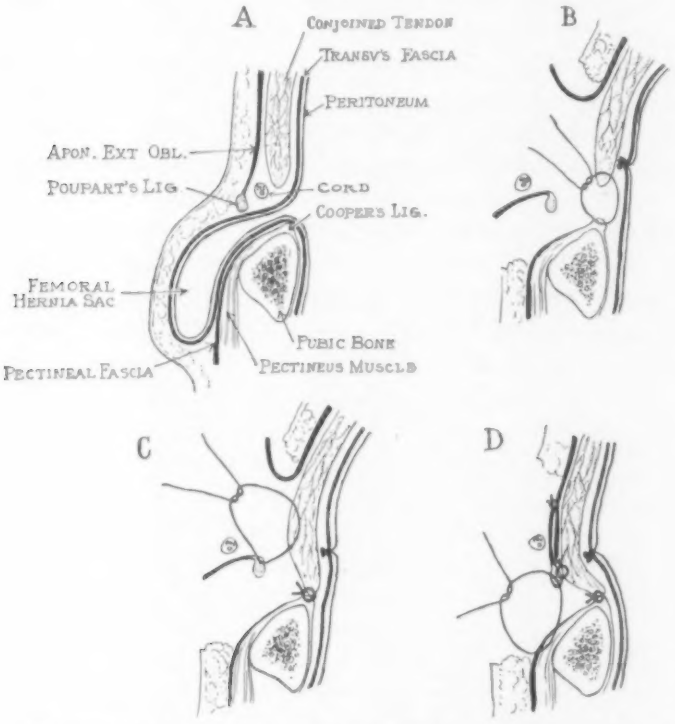

Fig. 11.—Diagram to show relations in combined femoral and inguinal hernioplasty. *A*. Shows cross section of anatomical relations in femoral hernia. *B*. Shows placing of suture of edge of conjoined tendon to Cooper's ligament. *C*. Shows suture of edge of conjoined tendon to Cooper's ligament tied and placing of suture of internal oblique muscle and conjoined tendon to Poupart's ligament somewhat above edge of muscle and tendon. *D*. Shows two previous sutures tied, upper flap of external oblique aponeurosis sutured to Poupart's ligament, lower flap of external oblique aponeurosis, overlapped and sutured on upper flap, and placing of suture of Poupart's ligament to pectineal fascia. Cord subcutaneous.

has left his bed. A suspensory bandage may be worn for a month or two after operation, but under no circumstances should a truss of any sort be applied.

I regret that I am in no position, at the present writing, to give any hard and fast statistics in regard to recurrence. Up to the time of my first paper, I had personally done about two hundred cases by this method, and had not seen any recurrence in any of these cases which I had been able to follow up. A good many of them, it is true, were army patients, of which I had lost track. Possibly some of these have since been reoperated upon by other

surgeons, but no recurrences from this group have as yet come to my knowledge. In the past three years I have added ninety-three cases, of almost every degree and variety and in patients of all ages, to my personal list, some of which, to be sure, are quite recent. I have been able to trace practically all of the cases in this second series. Up to date I have found, among them, two recurrences. One was in a most unruly and restless patient, fifty-five years of age, with a very large direct hernia. On the evening of his operation, he demanded and, through some misunderstanding on the part of the house surgeon and nurse, received an enema. Apparently, there was no trouble because of this unfortunate incident, but a few months after he left the hospital, a definite recurrence was noted, which, I believe, was produced by the patient's restlessness in bed and the premature enema. The second was in a man, fifty-six years old, with a relatively simple indirect hernia, with no very large sac or ring. The patient made an absolutely uneventful convalescence, the wound healed by perfect primary union, and I am entirely at a loss to account for the recurrence, which developed fifteen months after the operation. As yet, neither patient has consented to reoperation, so that I am unable to present the anatomical findings or even to attempt an explanation of the mechanism in recurrence after the operation described.

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INTRACERVICAL ENUCLEATION

By Frank H. Lahey, M.D.
of Boston, Mass.

Attention is directed to this method of intracervical enucleation, for removal of the cervix in hysterectomy for benign lesions, because in our hands it has proven such a rapid, safe and satisfactory measure for the accomplishment of this purpose.

It consists in the routine supracervical hysterectomy as done, for example, for fibroid uterus up to the point of section of the cervix. At this point, the cervix is not cut across or even removed by wedge-shaped excision, but is cored out by vertical circular incisions placed just within the outermost boundary of the cervix. The cervix is pulled up with each circular incision, until as the last incision reaches the vagina the thin remaining shell of cervical tissue is inverted from below upward, to drop back as the last circular incision separates the cervical plug from its shell of remaining cervical tissue. This leaves an opening through which a small strip may be tucked into the vagina to prevent the possible return of infected vaginal contents.

The stumps of the round, and if need be, the broad ligament, fit easily into the large aperture and may be sutured securely there. It has usually been necessary, in our experience, to place a large mattress stitch through the entire cervical shell, as shown in Figure 2, to control the oozing which occurs from the walls of the remaining cervical shell. It has once or twice been necessary also post-operatively to place a small piece of iodoform gauze in the vagina against the cervix for oozing, but in none of the cases has persistent oozing occurred.

We have made use of this method of getting rid of the cervix in hysterectomy for benign lesions to overcome the post-operative leucorrhœa and endocervicitis without producing in patients within the active sex age the vaginal shortening which results from the employment of complete hysterectomy for these lesions.

The disadvantages, as we have seen them, have been first the excessive oozing from the cervix during the process of coring, resulting often in a pooling of blood at the bottom of the pelvis and producing a somewhat messy condition at this stage of the procedure. This we have in some measure overcome by folding a towel into a trianglar shape and introducing the apex into the fossa of Douglas so that any ooze is caught in the hollow of the towel so placed. This oozing has been immediately controlled as soon as the ligaments have been introduced into the large opening in the cervical shell and the cervical mattress suture introduced and tied.

It has been our experience that the additional step of cervix coring has added perhaps a few minutes more to the time of the operation. This additional time is less in our hands, however, than that required to perform a complete hysterectomy for a benign lesion of the uterus.

FIG. 1.—Showing the method of coring the cervix by circular incisions just within the outermost boundaries of the cervical wall. The cervix is dragged up as each circular incision frees it from the remaining wall, until not a wedge but practically the entire cervix is removed. Note the lateral traction made by the double hooks to accomplish exposure for the next circular incision.

Because of the fact that a thin shell of the cervix, even though it be only the junction of cervix with vaginal mucosa, is left, the occurrence of carcinoma in the remaining cervical stump is a possibility with this technic as well as in the routine supracervical hysterectomy, where it is by no means rare. However, even with this possibility in mind, we do not feel that complete

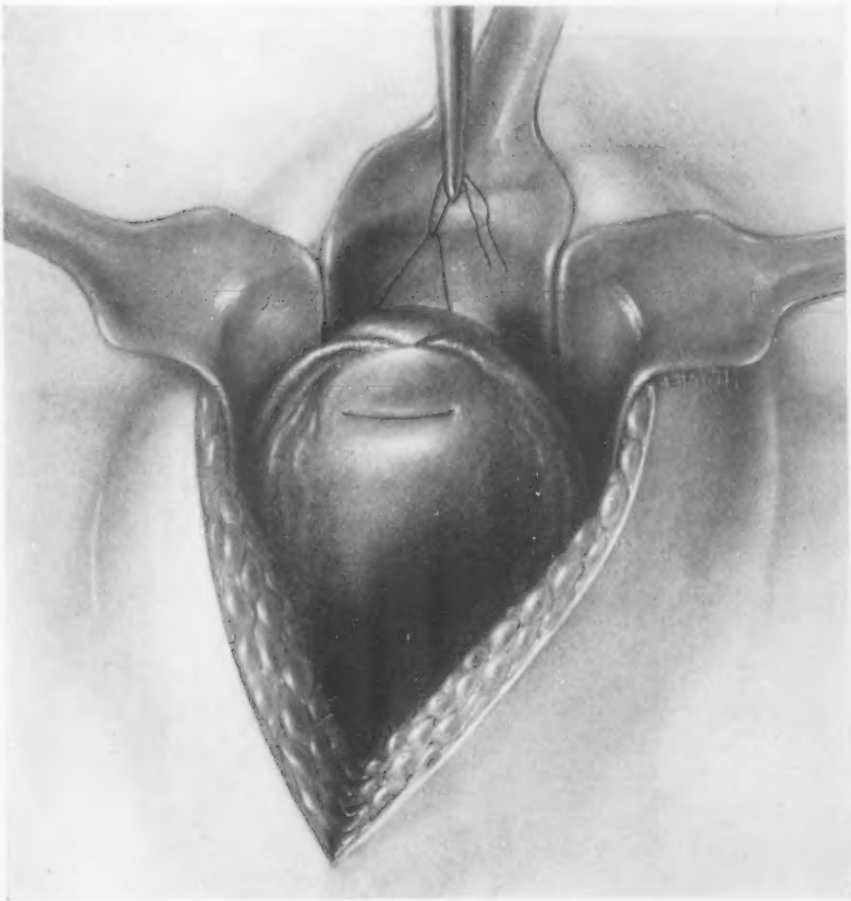

FIG. 2.—Showing the introduction into the cervix of the mattress stitch to control cervical oozing. Before this stitch can be introduced the bladder must be wiped down from the anterior face of the cervix. Approximation stitches are, of course, also introduced to close the cervical aperture and to fix the implanted ligaments in place.

hysterectomy in preference to hysterectomy by this technic is more indicated in a benign uterine fundus lesion than is complete hysterectomy upon a normal uterus to prevent the possibility of the occurrence of carcinoma.

The advantages have been that all of the cervix and cervical canal can be removed during active sex life with little or no shortening of the vagina, with but little time added to the operation, without danger to the ureters, and that excellent support can be obtained by the fixation of the round and broad ligaments as deeply as desired in the remaining cervical aperture.

FIG. 3a.

FIG. 3b.

FIG. 4a.

FIG. 4b.

FIGS. 3a 3b, 4a and 4b.—Showing photographs of two uteri opened and unopened to show the practically complete removal (except for remaining shell) of the cervix by this method.

SURGERY OF THE ECTOPIC KIDNEY

By John R. Caulk, M.D.
of St. Louis, Mo.

In order to direct attention to some of the interesting phases of this somewhat rare condition, six cases are herewith reported and discussed:

Case Reports.—Case I.—H. M., age sixteen, brought in as an emergency, April, 1919, complaining of pain in her left lower quadrant, burning on urination. Family and personal history negative. Present illness started two days before admission with sharp shooting pains in the left side between the lumbar region and the left lower quadrant. Pains sharp in character, but did not radiate. Patient had vomitted frequently and had had chills and high fever. Associated with this, there was considerable vesical disturbance, such as frequency and burning on urination. She had been diagnosed, by an outside physican, as having an appendix abscess and was sent to the hospital for this condition.

On examination there was a tender mass in the left side, low down, with considerable spasm over this neighborhood as well as toward the mid-line. Leucocyte count 16,000. There was no tenderness over the right side in the region of the appendix. Catheterization obtained very dirty urine from the bladder, containing pus and colon bacilli, no red blood cells. The following day she was cystoscoped and her bladder showed a generalized cystitis, but nothing else of importance. Catheters passed into both ureters. Considerable retention of cloudy urine came from the left. Complete X-rays were taken with catheters in place. (Fig. 1.) The right catheter went to the kidney in its normal position. The left crossed the mid-line, curved upward opposite the lower part of the fourth lumbar vertebra and made a twist over the promontory of the sacrum. Right kidney was found normal. Function excellent. Function of the left kidney fair. Left catheter retained for drainage. Pyelogram at a later date showed marked hydronephrosis. Patient showed immediate improvement, temperature dropped to normal the next day. The left kidney was repeatedly drained by ureteral catheterization and lavaged. Patient showed remarkable improvement although the function of this kidney remained always inefficient and the urine never free of infection. A nephrectomy was advised but refused. There were no other congenital defects demonstrable. Diagnosis.—Left ectopic kidney and infected hydronephrosis.

She was re-admitted three months later with a recurrence of the pain in her side, after having fallen from a table. She was again drained with the same findings as on her previous admission. Again she refused operation. I have been unable to trace her since this time.

Case II.—Man aged forty, mechanic, presented himself November, 1921, complaining of aching pain in lower left side and back. Past history, typhoid fever in young adult life, as well as recurrent chills and fever, however, no chills for several years until two months before admission. He began at first to have a dull pain in left lower back radiating down the left side over the bladder. This pain was never sharp, but aching and sickening, lasted several days then stopped. There had been some difficulty on urination. Would notice that his stream would stop and start. The pain in his side, he said, was always more severe when bladder was full, but was not relieved by urination. There was slight frequency, but no urgency or hæmaturia. For the last three weeks has had a continuous pain in this region. He lost weight and felt languid.

Examination.—He was a large healthy looking individual. Genitals well developed and normal, no congenital anomalies. Pulse and blood-pressure normal.

There was tenderness and spasm in the left side, just within the anterior superior spine. There was definite tender mass in this region running over to the mid-line. Pressure on this produced pain and also a desire to urinate. Another interesting fact in the examination was that there was some tenderness in the left kidney region. Urine was cloudy and infected with colon bacillus.

Cystoscopic examination showed a normal bladder. Catheters passed up each ureter the usual distance. From the left catheter came free dripping and several ounces turbid urine were immediately aspirated. Urine from the right side was clear.

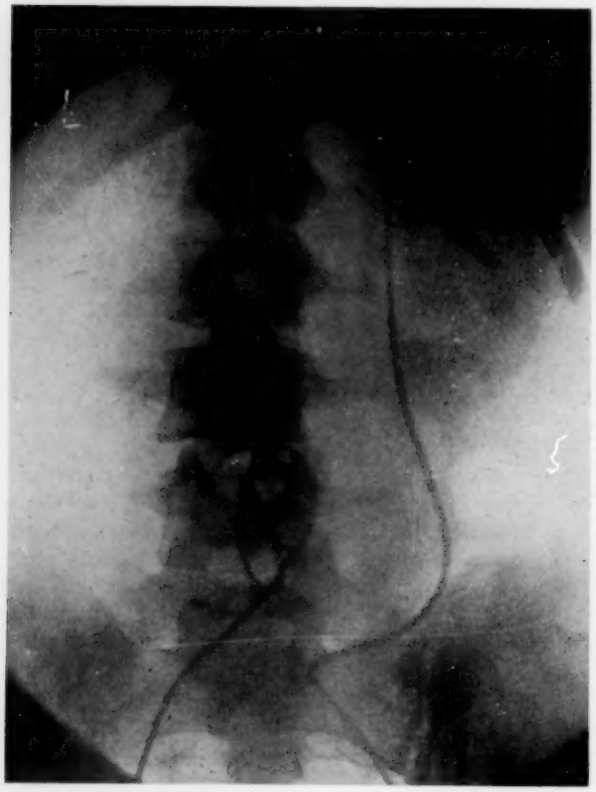

FIG. 1.—Showing catheter curled over promontory.

The X-rays taken with catheters in position, showed the catheter going to right kidney which was normally posed, but the left catheter crossed to the right opposite the middle and upper third of the sacrum, curling upward, making a large circle above the promontory of the sacrum. It then twisted downward upon itself. Pyelogram taken at a later date showed large hydronephrosis. The function of this left kidney was practically destroyed and the right kidney was doing a great deal more than its normal work.

In neither of these cases was there an impression that the catheter had not gone to position for the normal kidney and it is easy to see that, had not an X-ray been taken with the catheters in place, or a pyelogram been done, a lumbar incision would have been made, which would have failed to disclose the kidney. The low position demanded a lower abdominal incision.

Nephrectomy was advised and accepted and on November 26, the kidney was removed through a left similunar line incision, low down by the extra-peritoneal route. After opening the abdominal wall, the peritoneum was reflected inward, exposing a firmly fixed lobulated mass, tensely fluctuant and lightly adherent to the surrounding structures, resting upon the bifurcation of the aorta. The junction of this vessel with the iliacs was imprinted on its posterior surface as was found after removal. The vertical incision gave poor exposure and a trans-

verse incision was made through the abdominal muscles and fascia for about two inches toward the mid-line. This gave a perfect exposure and allowed freedom of manipulation. The vessels came from the left side of the aorta as well as from some of the deep pelvic arteries. The ureter was short and very taut and entered the anterior aspect of the kidney into a markedly dilated pelvis. There was not the slightest trace of perirenal fat. There were adhesions to the bladder, as well as to the vessels posteriorly. The mass was easily removed. There was practically no oozing. Wound was closed as usual, cigarette drains placed into the space from which the kidney was taken. Patient made an uneventful recovery and left the hospital in sixteen days.

Case III.—Mrs. M., age seventy, seen at St. Luke's Hospital, complained of frequent urination. Had always been healthy. She had no previous trouble of any sort. Had given birth to three normal children.

Two months before admission began to have frequency of urination, getting up at night six or eight times, and passing urine every hour during the day. With this there was an annoying low backache. There had been no history of renal colic, indeed there had been no other symptoms except those above described.

Examination.—Patient was wonderfully preserved. There were no congenital defects noted. There was some tenderness in the lower lumbar region on the right side and over the right iliac crest. Urine was cloudy, due to pus and colon bacilli.

Cystoscopic examination showed mild cystitis. Ureteral orifices were both normal. Catheter passed with ease to both kidneys. On the right side there was at least 4 ounces of retention within the kidney pelvis. X-rays taken with catheters in place showed the right catheter curled up low down on the right side over the sacro-iliac synchondrosis and extending up beyond the fifth vertebra. Left catheter went to the position of the normal kidney. Function of the two kidneys was similar and normal.

Diagnosis.—Ectopic kidney, right, infected hydronephrosis.

This patient has been treated for several months by ureter catheter drainage and lavage and is almost entirely relieved of her symptoms.

Case IV.—Mrs. R. E. M., seen at the Barnes Hospital, complaining of frequent painful urination, hæmaturia, dull pain in the left side. Patient noticed first trouble about eight years ago, when a slight frequency and burning on urination set in. About this time the pain in the left side became perceptible. This attack lasted for three weeks. She was then comfortable for two years. Since this time she has had more or less bladder distress. There have been five attacks of pain in the lower left lumbar region, pelvis and supra-pubic region. Her last attack was in January of this year. For the last few months patient has had fever, occasional chills, noticed tenderness in the left side over the crest of the ilium and a mass. She has became weak and pale and very short of breath.

Examination.—Patient is very sallow. Shows marked anemia, about 40 per cent. hæmoglobin, red cells in proportion, blood pressure 100 systolic. In February, following transfusion, her red blood count was 4,820,000. Blood pressure 120/75. There was a large mass filling the left flank running anteriorly over the crest of the ilium, tender, considerable infiltration of the tissues over the mass. Abdominal examination otherwise negative. Patient's heart and lungs were in good condition.

Cystoscopic examination showed a contracted bladder, the urine however was grossly clear. Bladder mucous membrane was thickened. There were two typical tuberculous ulcers, one on the base back of each ureteral orifice. The right ureteral orifice looked normal. The left markedly retracted, scarred, typical golf hole orifice. It was impossible to pass catheter up the left ureter. The catheter passed

up right ureter easily to kidney and got normal urine. The phthalein from the right side was equal to the total functional output, this coupled with clear urine gave the diagnosis of occluded renal tuberculosis with perinephritic abscess.

On February 7, 1923, the perinephritic abscess was drained, there being an enormous amount of pus evacuated. In feeling around during the drainage, it was found that the kidney was not in its normal position, but down in the lower part of the abscess cavity. Patient was drained, stood the operation well, received considerable relief from her previous absorption and toxemia. During the next few weeks she was given blood transfusions and three weeks later nephrectomy was done. The kidney was found to occupy position just above the promontory of the sacrum.

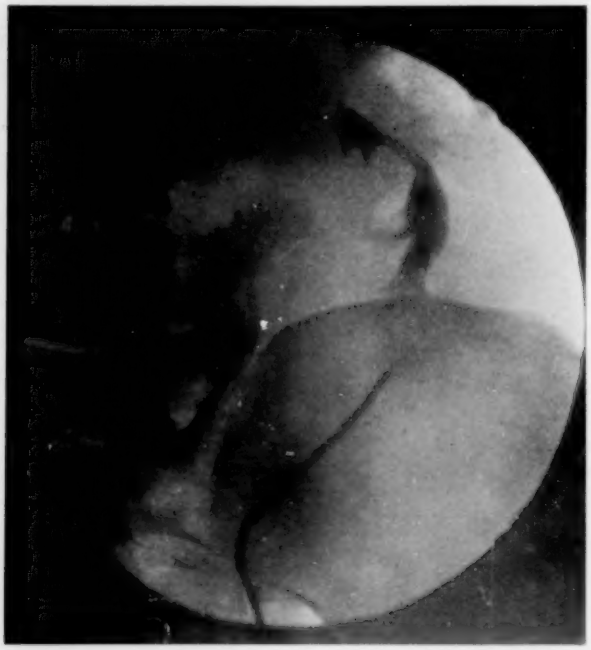

FIG. 2.—Both pelves on one side. Low down.

The incision of the previous operation was enlarged downward in order to get exposure. This was on the 28th of February. The blood supply came from the lower part of the aorta, the exact location of which it was impossible to tell. The ureter was short and taut. The kidney was slightly larger than normal with a fair sized abscess cavity at the upper pole with marked adhesions between this and surrounding tissue. The rest of the kidney was free. There was no perirenal fat around the kidney, it being bare. After the kidney was removed, I noticed that in the upper part of the incision, the perirenal fat seemed normal and in this fat was the adrenal body. Patient made a rapid recovery.

We were unable to diagnose this ectopic kidney during life on account of the inability to get a catheter or fluid up the ureter. Occasionally the shortening of a tuberculous ureter will pull down a kidney, but it would be impossible for the ureter to pull a kidney, normally placed, down to such a position. Furthermore this kidney was void of perirenal fat, the fat being in its normal position.

Diagnosis.—Occluded renal tuberculosis, ectopic kidney.

CASE V.—The fifth case is of a different type, being a congenital fused unilateral ectopic kidney, situated on the right side. Patient, age twenty-two, came to the hospital complaining of being practically bedridden on account of bearing-down pains in the lower abdomen and constant desire to urinate. She had suffered for several years and had been practically an invalid for the last two.

She urinated every few minutes without pain. There were no chills or fever. Her general condition was good, but she could not stand without feeling that "the

whole of her stomach was dropping out of her," as she described it. There was a large mass occupying her right side running up over her iliac crest into the lumbar region, reaching to the mid-line and down into the pelvis. This mass was not particularly tender, but very firm and quite fixed. Cystoscopic examination showed a normal bladder except there was a bulging on the right lateral wall as though something from without was pressing inward. Ureteral catheters passed easily the usual distance and normal urine was obtained from both sides. Phenolsulphonephthalein test right and left appeared in 2 minutes. Right catheter recovered 29 per cent. in 30 minutes, left 22 per cent. X-ray with catheters in place showed the one on the right side going up toward the normal kidney

FIG. 3.—Case V. Unilateral congenital fused kidney. U, ureter. B, bladder. A, artery.

region, but stopping about in the mid-lumbar region. Left catheter passed up to about the second sacral vertebra, then passed over to the right side and stopped about the promontory of the sacrum. There was no kidney shadow on the left side. Pyelogram showed two bizarre pelves on the right. (Fig. 2.) The right one above and the left one below and internal. No abnormal ureteral openings. The diagnosis of ectopic unilateral fused kidney was made.

The patient insisted that something be done to relieve her of her suffering, and, while we did not feel that there was much hope, an exploratory operation was done on January 26, 1914. A large right-sided incision, extending from above the crest downward toward the mid-line, was made, and an enormous mass was exposed, consisting of two definite parts which were completely fused, the connecting bridge being composed of renal tissue. The outer part was an elongated mass 9½ inches long, had extended from well up in the lumbar region down into the pelvis as far as the hand could reach. Joining this rather symmetrically shaped mass and completely fused with it was a more or less lobulated mass on its inner side which was

shorter and broader than the outer part. Neither had a definite kidney shape. The transverse diameter of the whole mass was 5½ inches. There were two large definite groups of vessels coming in across the inner lobule, one joining the elongated part at its upper extremity, the other entering the middle of the inner part, both of these came from the aorta. At the lower pole of this long outer mass were several very large vessels coming in from the deep pelvic vessels, just which ones could not be determined. The whole mass was so enormous and so fixed it was difficult to free. However, after freeing the mass as far as possible from above, the taut vessels from the pelvis were ligated and the kidney lifted at least one and one-half inches. It was then fixed to the lumbar muscles and fascia by numerous Brosdel stitches, and partially decapsulated in places in order to create adhesions. Wound was closed as usual. Patient stood the operation well and left the hospital in 32 days. She was considerably relieved of her bladder trouble at this time. The last I saw of her was January, 1917, when she stated that she had felt considerably relieved. She was still troubled with her bladder, urinating at least every two hours, but the bearing-down pain in her lower abdomen, while present to some degree, had been materially benefited. The result was far better than had been anticipated. The examination showed the kidney to occupy the whole right side to the rib margin below the anterior superior spine. General health excellent. She was warned against a pregnancy, and has not been seen since. I can find no other citation of fixation of a unilateral fused kidney.

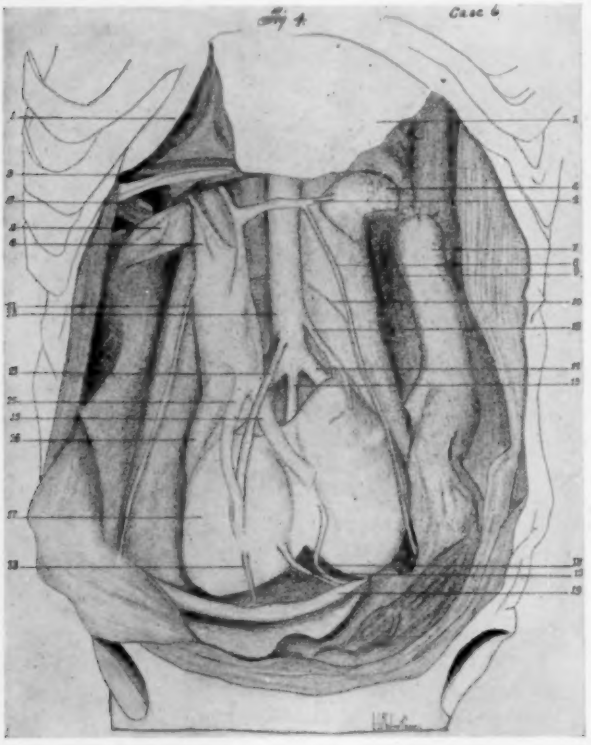

FIG. 4.—Fused pelvic kidney, negro male of 44 years. (L. L. Robertson del.) 1, liver; 2, suprarenal glands, 3, lig. teres hepatis; 4, left suprarenal vein; 5, gall-bladder; 6, inferior vena cava; 7, descending colon; 8, left internal spermatic vein; 9, psoas muscle; 10, left internal spermatic artery; 11, right internal spermatic vein; 12, aorta; 13, aberrant renal arteries; 14, left common iliac artery; 15, aberrant renal veins; 16, right common iliac vein; 17, fused pelvic kidney; 18, ureters; 19, peritoneal shelf.

CASE VI.—This case is an anatomical report of a very remarkable kidney which was encountered in the Anatomical Laboratory of the Washington University Medical School, and it is through the kindness of Dr. Robert Terry, Professor of Anatomy, and Mr. L. L. Robertson, one of the students who found it during the dissection of a subject, that I have the privilege of presenting this interesting kidney condition.

The kidney was centrally located, down in the pelvis below the promontory. There was complete fusion of the two poles, the left section being larger than the right. The measurements of this fused organ were 12.8 cm. in length, 11⅔ cm. in width, and 3 cm. in thickness. The point of union between the two kidneys was composed of kidney tissue as is usually the case. The pelves were deficient and lacked their usual support of enveloping renal tissue. The two ureters were shorter than normal, slightly coiled, the one on the left entered the kidney near the middle of its inner border at its junction with the slight depression at the isthmus. The other entered the lower anterior aspect of the right side. Blood supply was quite anomalous. There were three renal arteries and only one on the right side of the fused kidney entered the hilus. Two of the renal arteries came off of the aorta about 1.2 cm. above the termination of the aorta into the two common iliac arteries. The extra renal artery came off of the aorta at its termination making it appear as a trifurcation of the aorta instead of a bifurcation. Since there was no middle sacral artery, this renal artery may probably be an enlargment of the middle sacral changing its function to that of supplying the kidney. The internal spermatic artery on the right side passed under the inferior vena cava. The renal veins emptied into the inferior vena cava slightly above where it receives the two common iliac veins. Both renal veins passed from the hiluses. The left suprarenal vein emptied into the inferior vena cava at the normal place for the renal vein. It received as a tributary the internal spermatic vein from the left side. The one on the right side emptied into the inferior vena cava at the usual place.

The kidney was bare and not surrounded by any perirenal fat, kidney being held in position by its pedicle, pelvic fascias and peritoneum. The peritoneum at its inferior border formed a shelf-like structure which supported it from dropping any lower.

The suprarenal glands were in their normal location in the epigastric region at about the level of the eleventh thoracic vertebra, the posterior surface resting against the lumbar area of the diaphragm, even though the kidneys were not in position. Also the adipose tissue of lemon color, which is peculiar to the kidney, was found along with the suprarenal glands in the epigastric region. The blood supply to the suprarenal glands was entirely from the inferior phrenic artery.

CONCLUSION

(1) A fused kidney of this type is extremely rare.
(2) The fusion was of renal tissue.
(3) The renal pelvis varied markedly in size and shape, the ureters being somewhat short.
(4) The blood supply of this kidney was plentiful, due to the fact that it still retained its embryonic circulation.
(5) The kidney was firmly fixed.
(6) The suprarenal glands with adipose tissue which are found above the kidneys were in their normal position in the epigastric region.

These cases exemplify the two main types of dystopic kidney. The first type, to which the first four cases belong, being the single ectopic kidney with the other kidney in its normal position. The single ectopic kidneys were of the pelvic type, situated over the sacral promontory. All showed infection; one was mistaken for an appendix abscess, even though it was on the left side; another was thought to be some intestinal condition. All were associated with bladder symptoms. In none of them was there any other congenital

anomaly. Three showed large hydronephrosis which is a condition quite common to such kidneys. Another showed a tuberculous renal occlusion. The interesting anatomical and developmental fact about Case IV was the absence of perirenal fat around the kidney and its presence in the normal position, also the presence of the adrenal body in its normal place, indicating the difference of development of these different structures. I can find no satisfactory description of the development of the perirenal fat and its relation to the development of the kidney. The other cases represent the fused type of ectopic kidney. The first, Case V, being a unilateral type and Case VI the central type.

Ectopic kidney is supposed to occur once in every thousand autopsies and distributed about equally as to sex. Compared to other renal anomalies, it occurs in 16.9 per cent., according to Borland, who collected 121 cases of anomalous kidneys in 1910.

I believe that with systematic investigation with the X-ray and ureteral catheter, this condition will probably be found more frequently. The vascularization of the ectopic kidney has been the subject of considerable debate. Plummer in Surgery, Gynecology, and Obstetrics, in 1913, gives a complete summary of the condition and quotes various authorities. The general idea seems to be that a kidney has no permanent vascularity until it reaches its final position. If the permanent position is normal, the vessels are normal; if otherwise, the vessels arise from some nearby arterial trunk and tend to take a direct course to the kidney.

Some authors believe that the blood-vessels have an important influence in the ascent of the kidney—that the kidney is lifted to its final position, as Chute says in his recent article read before the American Association of G. U. Surgeons, in a sort of hand-over-hand manner, the upper vessels being the larger and stronger, and the lower ones becoming atrophied and letting go. Chute says it is the persistence of the vessels which should have atrophied in certain instances which brings about the kidney's inability to empty itself that results in hydronephrosis. which is so common.

Such kidneys are usually normal in size, though often they are found small. The most common resting place seems to be over the promontory of the sacrum, the impression on the kidneys of the bifurcation of the aorta is a common finding. The blood supply usually comes from the lower part of the aorta or from the internal iliac vessels or their branches. Accessory vessels are frequent. The vascular supply of Case VI is very interesting, particularly in two features, first, that the middle sacral has assumed the function of the renal artery and two, that the internal spermatic on the left went to the left suprarenal vein. Since normally the suprarenal veins empty into the renal, it may be that the renal vein is a composite of the suprarenal and renal. The ureter is shorter than normal and is very frequently extremely taut, as in my second case. It usually enters the bladder at its normal site and the kidney on its anterior surface.

The left kidney seems more prone to ectopy than the right, in contradis-

tinction to the floating kidney. The ectopic kidney is occasionally found during abdominal operations. On account of its atypical position with its resulting pressure and its ureteral insertion, hydronephrosis and pyonephrosis are frequent in their occurrence. The usual lesions have been observed in such kidneys.

Symptomatology.—There may be no symptoms whatever from such a mal-posed organ, and, as was said before, they are often accidentally found. The most common symptoms are pelvic, lower abdominal and urinary. They are frequently mistaken for tubo-ovarian diseases and occasionally intraperitoneal conditions, particularly when the kidney has become infected.

Rectal symptoms have been noted as quite ordinary in the pelvic type of kidney. It is interesting that Case VI had had during life considerable rectal trouble and had undergone a rectal operation.

Two of the cases illustrate the importance of the urinary examination. Both were thought to be abdominal conditions, but the urinalysis gave the first clue to the true nature of the lesion. The diagnosis is quite simple with the present-day methods and needs no comment, and it shows the great value of combined ureteral catheterization and radiography. It shows how easily one could be led to believe that one was dealing with an infected kidney in its normal position since the catheters usually go their full length.

One should have no trouble in differentiating such a condition from a movable kidney.

Aside from the usual findings, one point which is not usually spoken of is that the pyelogram of the pelvis of an ectopic kidney is almost invariably centrally located over the spine, whereas the pyelogram of a floating kidney is lateral.

The treatment should be expectant in the pelvic kidney which is causing little or no disturbance, except possibly a few reflected pains, particularly if the kidney shows no infection.

In young women who are liable to become pregnant, nephrectomy is indicated, it is for this reason that Chute removed the kidney in a quoted case, as it would have had an extremely deleterious effect on pregnancy and pregnancy on it, although there have been cases reported of pregnancy going to term in the presence of an ectopic kidney.

It is easy to see how serious an effect such a kidney as Case VI would have on pregnancy, the chances are that pregnancy would have to be terminated.

Streäter lays down the following rules: First, " If discovered at the beginning of pregnancy, laparotomy, dislocation or fixation should be done. Second, if discovered later, consider the advisability of the induction of premature labor. Third, do not remove a normal kidney shortly before or during labor. Fourth, if discovered after labor has begun, a pathological kidney may be punctured to allow delivery and a nephrectomy done after."

If they misbehave, and when they become badly infected, nephrectomy is the only operation, provided the condition be unilateral.

Some authors have advised dislocation and reimplantation to relieve the mechanical results, but it is personally felt that this operation is hazardous. In the large unilateral fused kidneys, such as in the fifth case, there is nothing to do but elevation and fixation. In this instance it worked very satisfactorily.

The usual operation has been done by means of ventral laparotomy. Sacral operations have been done, but are difficult and unsatisfactory.

Vaginal nephrectomy has been reported by Cragin. I feel that there is no question from personal experience that the extraperitoneal operation with proper abdominal incision is the method of choice. One needs free exposure because the kidney is so firmly fixed and adherent to very important structures.

For this reason, the crucial incision which was made in one case, simplified the whole procedure and made a difficult operation a very simple one. I would suggest its more frequent employment.

ADVANTAGES AND DISADVANTAGES OF METAL PLATES IN THE TREATMENT OF FRACTURES OF THE LONG BONES*

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Mr. Lane, in 1909, said that for sixteen years he had made it a habit to operate on all cases of simple fracture of the long bones, in which he was unable to restore the fragments to their normal relationship and in which it was important to the individual that his mechanics should not be impaired. He advocated the use of plates and screws as the means of maintaining reduction and described a careful technic in operating. Through him surgery of fractures received a tremendous impetus.

His method seemed to overcome so well many of the difficulties in the treatment of fractures it was tried out with considerable enthusiasm. The literature was soon filled with articles on platings, on the kind of plates and screws to use and the instruments necessary to apply them. When reports began to accumulate it was seen that platings had some drawbacks. Operative wounds became infected, plates broke and screws loosened under strain and much of the benefit of operation was lost.

While opinion as to the worth of Lane plates was still in abeyance the war began. Fractures had to be treated literally by the thousands. They were nearly all compound, comminuted and infected. It was found that suspension and traction, particularly skeletal traction, best met the requirements. Many surgeons became familiar with the method and have found it more and more applicable at home. In fractures of the femoral shaft, where the Lane plate was expected to supersede all other methods of treatment, suspension and traction has now won out as safer and as certain of results.

Thus, owing to fear of the besetting dangers of the open operation and increasing appreciation of suspension and traction, plating is mentioned under the breath. "Whether right or wrong," Freeman says, "when an idea has once gained credence among surgeons it has a tendency to stick. This conservatism is good insofar as it prevents the easy acceptance of half baked theories, but it is unfortunate when it inhibits the introduction of new and valuable procedures as it sometimes does." Are we right or wrong in this growing suspicion of the Lane plate? Has it a proper usage? Do the dangers outweigh the advantages?

To help answer these questions I have examined the records at the Roosevelt Hospital and looked up what other statistics I could find. We have 66 platings done on 63 patients by a dozen operators. With the exception of six fractured femurs all cases were operated since 1912.

* Read before the New York Surgical Society, February 28, 1923.

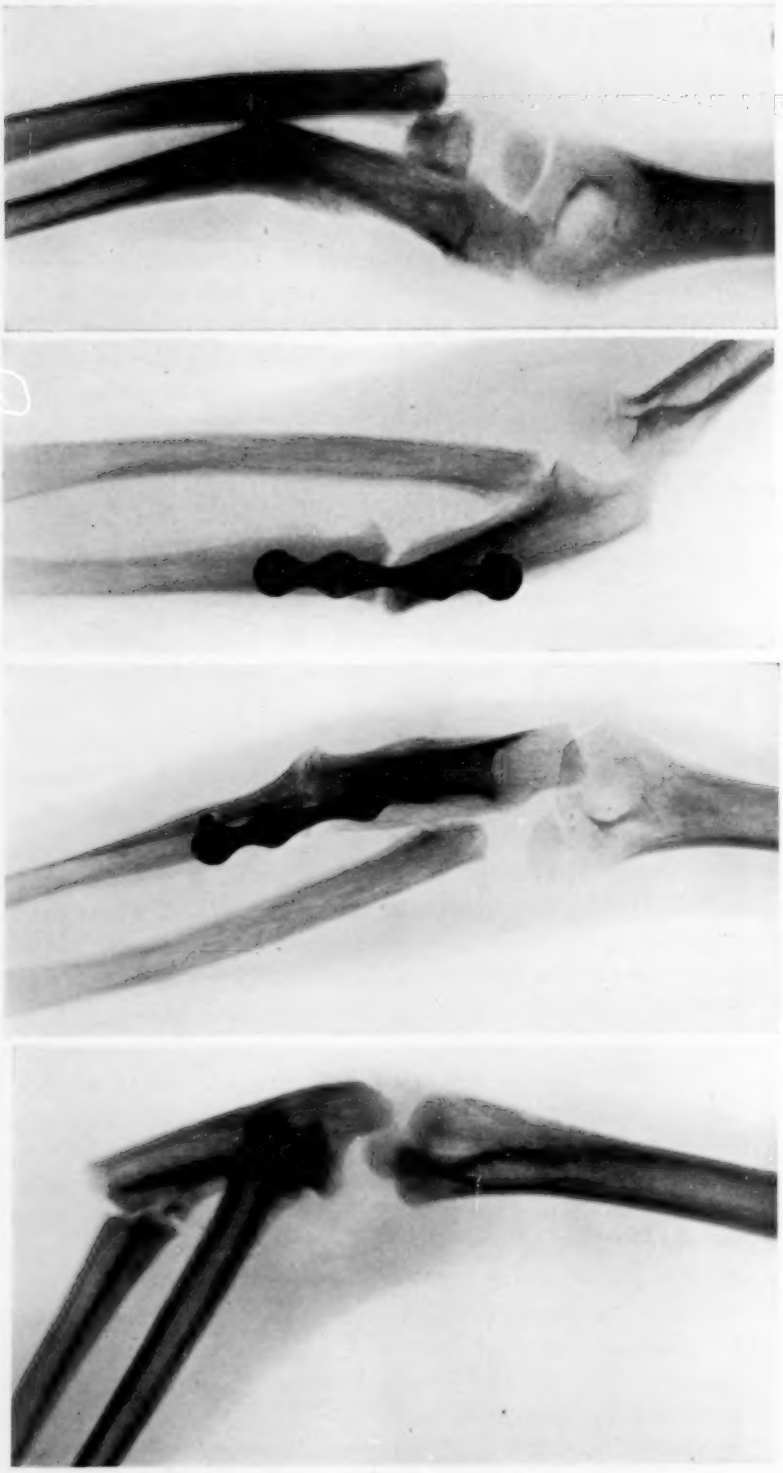

FIG. 1.—Fracture of upper third of shaft of ulna and of neck of radius. X-ray taken seventeen days after accident shows result of treatment in dispensary. X-ray taken on thirtieth day after accident shows operative result. On the eightieth day plate was removed. Function at this time perfect. Union firm, slight angulation of ulna.

Infection.—Babler of St. Louis in 1912 reported 66 platings with 19 infections, or 28 per cent. Wight of Brooklyn, in 1920, reported in 263 open reductions 69 infections, or 26 per cent. These reports make infection appear formidable. Sherman of Pittsburgh, in 1912, however, reported 55 platings with 2 infections, or less than 4 per cent. In our cases there were 7 infections, or 10.6 per cent. Three infections occurred in fractured femurs, 2 in tibias, 1 each in a radius and a clavicle. The infection was noted in 2 femurs only at removal of the plate. All infections healed promptly. Both tibial infections were in compound fractures.

Infection sometimes occurs at the site of a fracture not operated, and it cannot always be avoided in compound cases operated upon but usually it is due to faulty technic. If Lane's dictum, to touch no sponge, suture material or part of an instrument that goes into the wound, is carefully carried out, infection should be kept down to 5 per cent., and when it does occur should be mild.

Delayed Union.—Opinion is nearly unanimous that plating delays union. Statistics to prove it, however, are meagre if not lacking. Estes of Bethlehem has determined the percentage of delay after the closed method of treating fractures. He tabulated the time of union in uncomplicated cases for each location and found the majority united within certain limits. All fractures requiring eight days more than the upper limit were regarded as showing delayed union, and union was considered to have occurred when there was no vestige of abnormal mobility at the site of fracture. Counting non-union with delayed union he found in 246 fractures of the shafts of long bones union delayed in 11 per cent. of fractures of the humerus; in 25 per cent. of the femur; in 26 per cent. of the radius and ulna; and in 32 per cent. of the tibia. In comparing his plated cases there were six delayed unions out of 24, or 25 per cent. There were no delays in the upper extremity but in the lower the percentage was higher than in the closed method—33 per cent. for femurs and 57 per cent. for tibias.

I am chagrined to find so little information in our histories of fractures as to time of union and as to functional results. There is some excuse for this, of course, owing to the fact that many fractures, other than those of the femur, leave the hospital when we are assured that their wounds are clean and supporting apparatus efficient. They return to have splints or casts removed when union is noted, but the fact and date of occurrence, unfortunately, do not get put upon their records which are no longer at their sides.

The only group in which there is sufficient evidence as to the progress of union is the tibial. Three showed union within normal limits, eleven were delayed and one lacked data. These figures give 79 per cent. of delay after plating. But seven of these fractures were compound, and compound fractures themselves require a longer period for union than the uncomplicated. These groups are too small in numbers to settle the question of delayed union after plating, but are on the side of the very generally expressed opinion in the affirmative.

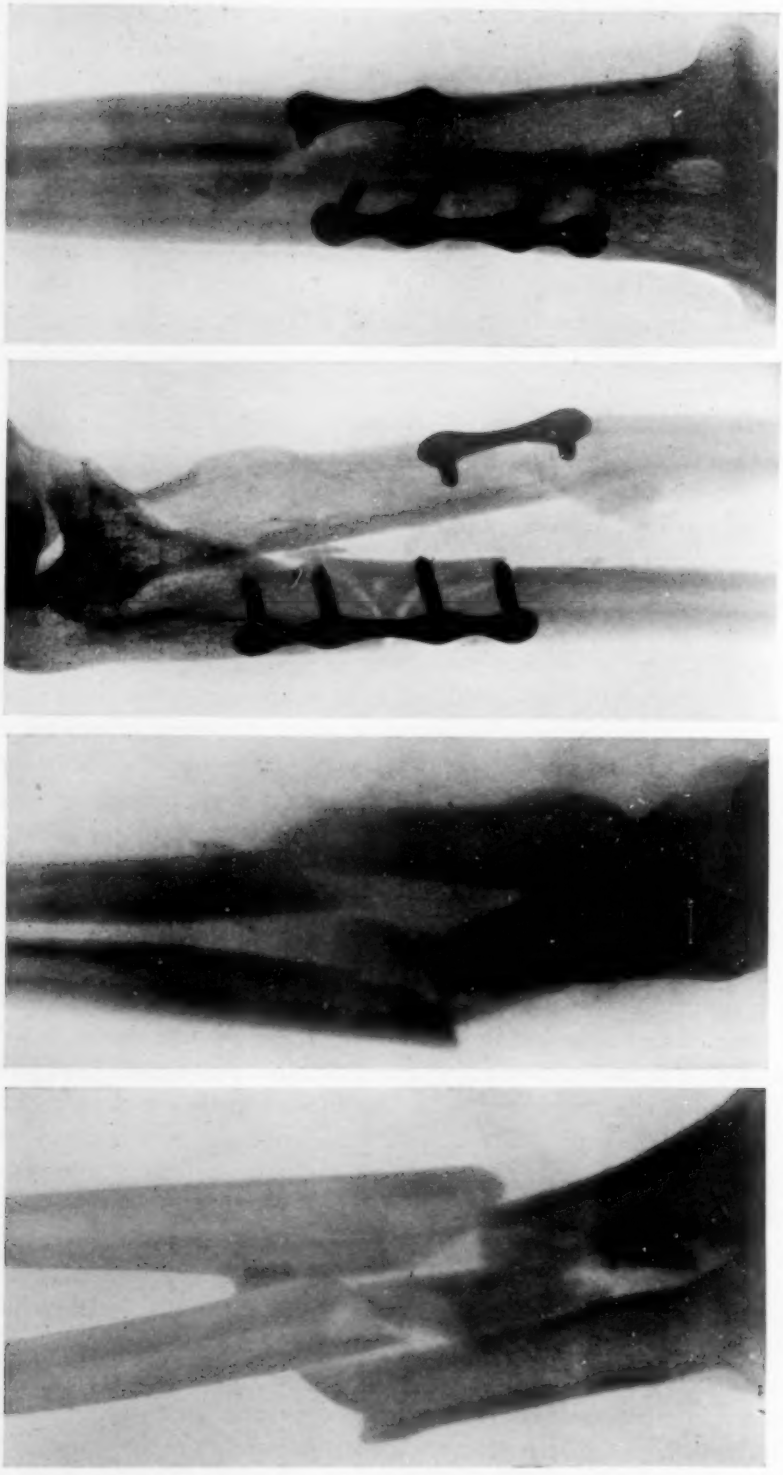

FIG. 2.—Fracture of shaft of ulna compound comminuted; and fracture of radius after attempt at reduction. Shows result of operation on ulna done five days after injury and on radius nine days later.

Theoretically, delay should be less frequent after plating for the three principal causes of delay—separation of fragments, interposition of soft parts between fragments, and faulty immobilization—should all be eliminated with a properly applied plate. It may be that the operation is done late. Delay from this cause seems subject to a fairly satisfactory explanation. The original fracturing injury is the greatest stimulus to repair. Operating after repair has begun disturbs or destroys that repair which must start fresh with its stimulus somewhat spent.

Wight, in his statistics of operations on 263 fractures of long bones, gives eight weeks as the average time of union in recent cases as compared to eighteen weeks in old cases. But what is "recent" and what is "old" in time? One infers that "old" means three weeks, a month or more. It is seldom specified. But it should mean much less than that if it is to be considered in terms of delayed union. We know that the first few days after fracture are spent in absorbing blood clot, debris, etc., and the next few days in forming connective tissue which is acted upon by the osteoblasts to form provisional callus, and this may be nearly complete at the end of a week. The callus hardens when lime salts are deposited in it. The whole process can be very short. Therefore, I think, "old" should mean after the first week and the preferable time to operate about the third day.

Another point about union, it is difficult to decide if it has taken place after plating, for the plate, unless the screws have loosened, gives firmness at the fracture. One has to estimate union by the amount of callus as shown by X-ray. It is notable that fractures, the ends of which are in perfect apposition, show less callus than those the ends of which are somewhat separated. One may decide, therefore, that union has not yet taken place after plating because the amount of callus is small.

Finally, *union after plating*, providing it occurs, is of secondary importance, What one expects or hopes for is an anatomically and functionally correct limb, and this can be shown to be more frequent after platings than after the closed method.

Sir Robert Jones, reporting the findings of a Special Committee of Inquiry of the British Medical Association, gave 79.5 per cent. good results in primary operations on 147 fractures as compared to 53.3 per cent. good anatomical results plus 16.1 per cent. good functional result, despite a poor anatomical one in 2596 non-operated cases, or 69.4 per cent. as compared to 79.5 per cent.

In our series, the femoral group only provide sufficient information as to results. Of 32 cases, 3 died and 3 lack data. Eighteen of the remaining 26 had no shortening or deformity; 2 had one-quarter inch shortening, one with no deformity, the other with slight bowing; 3 had one-half inch shortening, 2 with no deformity and the third with slight bowing; 2 had one inch shortening with angulation, and 1 is marked "considerable angulation." As one-half inch of shortening is easily compensated without lameness this amount is taken as a satisfactory result. There are, then, 23, or 88 per cent., within this class.

FIG. 3.—Antero-posterior view of a case plated thirteen years ago with an aluminium plate.

However, three of these had limitation of flexion, two to 45 degrees and the third to 5 degrees, which reduces to 76 per cent. the excellent results. Two of these latter three had extenuating circumstances connected with the limitation of flexion; one a boy of 18 had a fracture of the condyle leading into the joint, the other a woman of 43 had a compound fracture with badly injured extensor muscles. These figures fall slightly below those of the British Committee, but the reason may be that they were those of the most difficult group in which to get results.

The three deaths referred to occurred, one from shock, one from lung abscess on the 28th day post-operative, and one from bed-sore sepsis on the 38th day post-operative. The latter was a man of 60 years, treated first by caliper traction but whose skin would not stand the pressure caused by a confined position. He was operated in the hope that in a cast he could be turned often enough to relieve the sore points.

A mortality rate of 3.3 per cent. (I do not count the bed sore sepsis death, as it was in no way connected with the operation) is a serious drawback to open reduction. As the deaths occur mostly in operations upon fractures of the femur, as these cases are now probably better treated by caliper traction and as few femurs henceforth will therefore be plated, the mortality rate should be brought to less than 1 per cent.

Breaking of plates occurred more frequently formerly than now. They are better made and can stand all the strain required. They should be tested with heavy forceps, however, before being used. This was not done in one of our cases and eight days post-operative, while adjusting the leg at an inspection of the wound, the plate was heard to snap. In one other case, a refracture of the femur occurred through the callus, at which time the plate was broken.

I have records of removal of 26 plates, 14 of the 15 in the tibial group, 10 of the 32 in the femoral group, 1 from the radius and 1 from the ulna. Mr. Lane does not think they need to be removed, but I feel it wiser to do so in most cases as soon as they have accomplished the desired result.

Loosening of the screws is one of the trying after events of platings. This more often happens in an old fracture with considerable displacement where the muscles have had time to set in contraction. The reduction which the screws must maintain will then be against strong resistance. Unless the external fixation assumes most of this strain the screws will loosen. The bone of a young growing individual is poor holding ground for screws. When platings are done within the first few days after fracture the screws will hold for the muscles are then in balance and produce no strain.

Unfortunately, most of the operations are done late. Of 57 cases with information as to time, after accident, of the operation 16 were operated in the first week, 13 in the second, 9 in the next two weeks and 19 in the second to the sixth month.

The indications for the use of Lane plates are three: (1) When proper reduction cannot be maintained without direct fixation of the fragments.

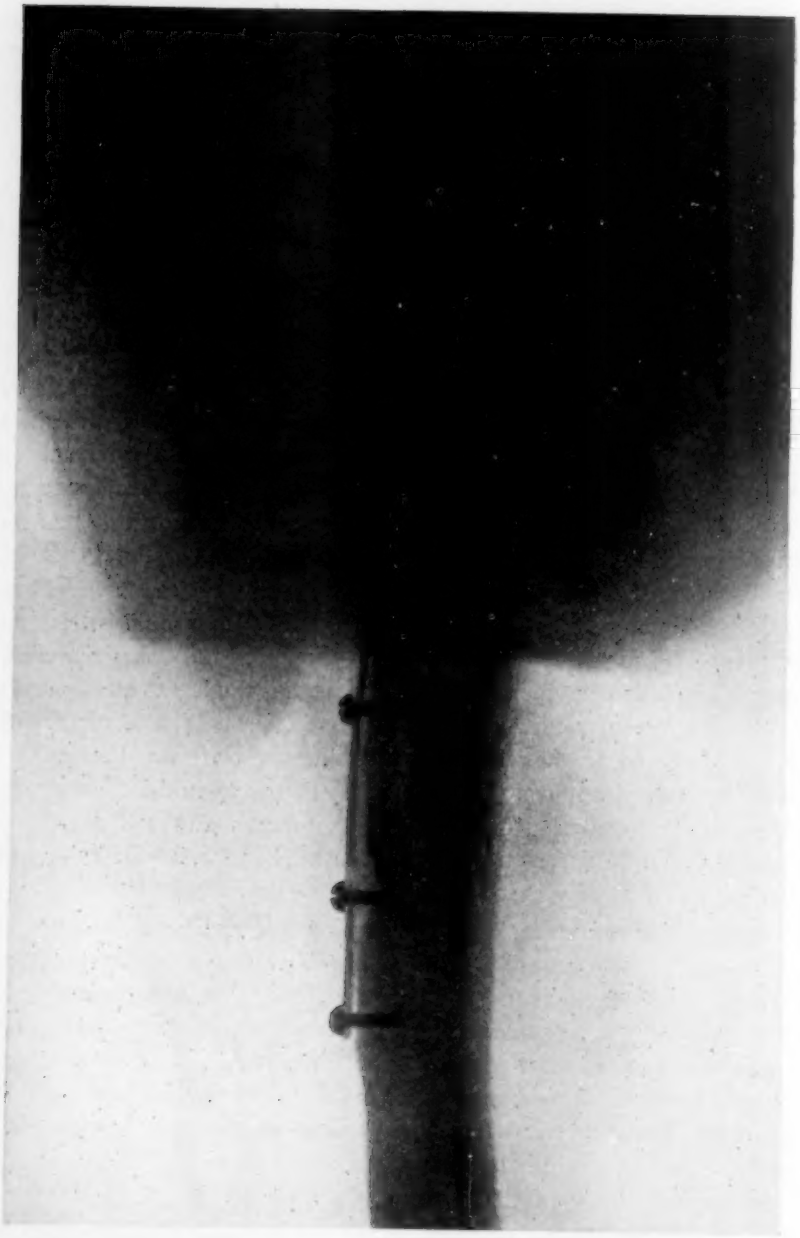

FIG. 4.—Lateral view of a case plated thirteen years ago with an aluminium plate.

(2) When non-union is the result of too great separation of fragments. (3) When faulty union has taken place.

Under the first indication a qualification, by Ashhurst and John of "proper reduction," is so pertinent it is worth repeating: Impossibility is a relative term since what is impossible for one surgeon may not be for another; and the word "proper" reduction is employed not to imply that operation is indicated whenever accurate, exact perfect anatomical replacement is impossible but only when such degree of reduction as is requisite for proper function cannot be secured without operation. Also they consider "cannot be maintained" a relative condition depending upon the skill of the surgeon in devising and applying efficient retentive apparatus and upon the extent to which displacement occurs.

With regard to the second indication it may be questionable whether bone grafting is not a better procedure. To most of us the plating will appeal as easier and not necessitating an injury to another bone. Probably plating will be tried first in the majority of cases.

With faulty union other methods no doubt will be tried, but plating seems as good as any.

In our series plating was performed once on a clavicle, 4 times on the humerus, 5 times on the ulna, 9 times on the radius, 15 times on the tibia and 32 times on the femur.

To sum up.—Plating is a justifiable procedure in a properly equipped institution and in the hands of a careful surgeon.

What statistics there are, tend to confirm the nearly unanimous opinion that plating delays union.

However, the time elapsed after fracture before operation may be as important a factor in the cause of delay as the plate itself.

Delay of union provided union takes place is of little consequence, compared to the better results to be obtained by plating.

Now that fractured femurs are treated almost entirely by suspension and traction, plating will not be done as often as formerly, but when limited to the lesser bones should give even more satisfaction.

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WOUND OF FEMORAL ARTERY AND VEIN

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and

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Bullet wounds of large blood-vessels are comparatively rare occurrences in civil life, and are apt to be seen only in the large general hospitals. This is particularly true of that class of cases which comes under the observation of the surgeon at a late date subsequent to the injury, for relief, not for the original wound, but for some complication thereof, which impedes his daily routine. The old idea that perforation of a large blood-vessel meant sudden death unless immediately checked has long been dispelled by a formidable array of case reports in the literature showing recovery to be the general rule, even in very long-standing injuries. Immediate fistulous communication and clot formation covering it have been life preservers, and one is almost inclined to the belief of the purposefulness of all the acts of nature when such a case comes under his observation.

The following case we consider unusual, not only because of the length of time elapsing between the date of injury and operation, but principally because of the destructiveness of the lesion, the bold method of treatment, and the results obtained. The management of this lesion herein to be described refuted many of our categorical ideas, but at the same time drove home with vigorous emphasis much which has already been laid down as clinical fact by that great path finder, Halsted.

Case Report.—J. E., Jr., single, age twenty-nine, entered the National Military Hospital, Dayton, Ohio, June 27, 1922, for relief of pain and swelling of the left thigh. The family and past history were essentially negative except for an old fracture of the left ulna which united in excellent alignment.

Ten weeks before admission while holding an automatic in his hand it exploded, the bullet entering the left thigh at the inner side midway between the head of the femur and the knee-joint. He says that the blood "came out in gushes," he walked to the nearest physician, who tried to remove the bullet and stop the bleeding. The doctor probed the wound, treated it with phenol, and bandaged it, which measure stopped the blood flow. Patient returned home feeling fairly comfortable.

One week later he felt a dull continuous pain at the site of injury and noticed a slight swelling of the affected thigh. The pain and swelling gradually increased, the pain becoming so intense one week ago as to render locomotion impossible.

Physical examination showed a well developed male weighing 160 pounds. The left thigh was greater in circumference by 6 cm. than the right; marked varicosities were plainly discernible even at a distance. At the apex of Scarpa's triangle was the irregular scar of the wound of entrance. The wound of exit

was 9 cm. down, inward and slightly posterior. On palpation, the skin of the thigh was hot and under marked tension, very similar to brawny œdema. Deeper palpation met with marked resistance and elicited severe pain.

The knee-joint could not be moved without acute suffering. The popliteal and dorsalis pedis arteries were not palpable. T. 99.8, P. 84, R. 22. Blood: Hg. 85, W. B. C. 6800, Coag. time 5 minutes. Urine: Dark, cloudy, acid, sp. gr. 1030, slightest possible trace of albumen, no sugar or casts.

The patient was operated upon by Doctor Grover with Doctor Fisher assisting. Upon entering the affected area, a large irregular reddish-black mass presented, resembling an old blood clot. This was carefully removed, and in so doing, we were amazed at its tremendous size. As soon as the thrombus was out of place, for such it was, a large stream of blood gushed forth. The large cavity of the wound was immediately packed with gauze and by tightening down on a tourniquet, the blood was checked and seen to have come from the femoral artery. The femoral artery showed a longitudinal jagged rent 3 cm. in length, and laid open across its entire diameter; the accompanying vein was likewise torn open, but at a slightly lower level. The artery and vein were both ligated doubly, with No. 3 chromic catgut proximally and distally, and the injured portions removed. A gutta percha drain was placed in the large cavity left by removal of the thrombus, which weighed four and one-quarter pounds. No normal muscle tissue was seen in the wound and all detritus was carefully removed. The patient returned to the ward in moderate shock. The next day the temperature rose to 101.6 and the wound was draining freely. For the next four days the temperature ranged from 99.4 to 100.6, the wound draining pus the last two days. On the fifth day the temperature fell to normal and drainage ceased on the ninth day. From then on the convalescence was uneventful.

Three weeks following operation, the left thigh was no larger than the right, the patient walked freely, easily, without pain or limp; the popliteal and dorsalis pedis arteries were not palpable; the left leg felt warm, easily bled upon pin prick and in every way seemed as normal as the right side. Four weeks after operation the patient was discharged. He was last heard from five months after operation, carries on his daily routine and has forgotten all about his wounded leg. No untoward effects were at any time noticed.

As this case shows, the method of treatment obtaining best results is ligation of artery and vein. To do less is to secure less. Others may maintain that end-to-end anastomosis or vein graft to repair arterial defect have advantages over ligation, but one can reasonably doubt this, since end-to-end anastomosis implies freeing the artery from its resting place for a considerable distance, and tension in bringing the ends together. Such a procedure may be preferable in dealing with the popliteal artery, but in the case of the femoral, the literature is too replete with recoveries following ligation to admit of the other method. LaRoque has discussed this question admirably, and is definite in his preference for ligation. Even in cases in which infection has taken place, gangrene is so rare following ligation of the femoral, that one can hardly bring himself to believe that end-to-end anastomosis is preferable. Halsted has definitely shown that aseptic ligation is not followed by thrombus formation.

The question often arises should the vein also be ligated whether it be injured or not. Halsted, Neuhoff, St. John, and many French and English

surgeons, as a result of their war experience conclude that there is less danger of gangrene when this is done.

There is no particular necessity for performing the operation immediately. The patient either bleeds to death at once or survives. The immediate danger is acute dilatation of the heart due to the fact that the blood is unable to get by the large thrombus, or if an arteriovenous fistula has formed it is returned immediately to the heart, throwing too great a burden and too sudden a one upon this vital organ, causing acute dilatation. Halsted has clearly shown this. If the proximal end of the artery dilates extensively, it carries with it all the dangers of an arterial aneurism, including the development of gangrene. If the wound is not operated within the first 36 to 48 hours and no inflammation is present, the operation can be performed at the leisure of the surgeon. Our case waited ten weeks, and probably would have waited longer had not inflammation arisen which caused acute pain. A large percentage of all wounds of large blood-vessels in civil life are due to bullet and stab wounds. Other reported causes, however, are fracture at hip or shoulder, accidental wounds in operations upon hernia, carcinoma, inguinal glands and abscess, and one case of rupture of iliac, due to removal of a drainage tube following removal of ureteral stone low down.

We wish to express our thanks to Col. James A. Mattison, M.D., for his helpful suggestions, and for his permission to publish this case.

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TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting Held January 8, 1923

The President, Dr. John H. Jopson, in the Chair

RUPTURE OF TENDON OF EXTENSOR LONGUS POLLICIS

Dr. Astley P. C. Ashhurst read a paper with the above title.

PLASTIC REPAIR OF CHEEK

Dr. George M. Dorrance presented a case to illustrate the pedicle method of closing the defect. The patient had had a carcinoma of the mucous membrane of the left cheek and left half of the inferior maxilla with swelling in the submaxillary region. Dr. Wm. L. Clarke had treated the malignancy with radium and X-ray, and requested him to remove the left half of the inferior maxilla. This was followed by fulguration of the entire malignant area, and more X-ray and radium. When next seen the wound was entirely healed and he had a defect of the left cheek measuring 1¾ by 2 inches. As all the cheek still showed the effect of the X-ray, it was impossible to use the surrounding tissue. A pedicle-tubed flap from the neck and chest was employed. The pedicle was raised and tubed. Ten days later a flap was outlined and the end of the flap was turned in to form the inner lining. Seven days later when the two surfaces of the flap had united, the turned-in end of the flap was divided where it turned over; the flap with the pedicle was raised. This flap had an inner lining that could be sutured to the mucous membrane on all sides and an outer lining that could be united on three sides to the skin edges. The edges of the defect in the cheek were freshened and the mucous membrane with a small amount of underlying tissue turned in. The skin edge was raised and turned outward. The flap was united both on the mucous membrane and skin edges. The pedicle was divided on the tenth day and returned to its former bed. The free skin edge of the flap was sutured to the surrounding skin. The main point in this operation was the formation of the inner lining that allowed it to be sutured to the surrounding mucous membrane in all parts.

Dr. A. P. C. Ashhurst had had two fatalities from secondary hemorrhage in operations of this nature. Both patients had carcinoma of the mucous surface of the cheek and he thought death occurred because he tried to do the whole operation in one sitting. Hotchkiss had devised an operation restoring the cheek by turning up a flap from the neck, which had proved satisfactory. Von Eiselsberg splits the tongue horizontally and turns it up to the upper alveolus, to form the inner wall of the cheek. Both of his fatal cases did well for a time; after ten days or so they had secondary

hemorrhage from the carotids. Doctor Dorrance stated that in his cases one year elapsed between the beginning of treatment and the final closure of the wound of the second operations. If his patients had not died their wounds would have been closed in a few weeks.

ANAPHYLAXIS FOLLOWING BLOOD TRANSFUSION

DR. GEORGE L. CARRINGTON read a paper with the above title, for which see page 1.

DOCTOR PFEIFFER had also had a disconcerting experience with transfusion several months ago which he had been unable to explain. The patient, a Jewish woman, aged thirty-eight, was admitted to the Abington Memorial Hospital, May 29, 1922, suffering from bichlorid poisoning with the usual accompanying nephritis and enteritis. The day after admission, both kidneys were decapsulated by Doctor Outerbridge on account of the scantiness of urine, almost amounting to suppression. She became progressively more anæmic and on the third of August, 1922, her blood count was 27 per cent. hæmoglobin; 2,050,000 red blood cells; 7600 white blood cells. Transfusion was done on the following day. The donor was her husband, a healthy, full-blooded man, who showed no abnormalities of any kind. Examination showed that both the donor and recipient belonged to group No. 4. Both agglutination and hæmolysis tests were negative. Accordingly, he proceeded to make the transfusion by the usual citrate method. There was no technical difficulty or delay or departure in any respect from the usual technic and procedure. The tube and supplies had been used a number of times before for the same purpose and the citrate solution was fresh and sterile.

After about 25 c.c. of blood had been transfused into the patient's vein, she complained of oppression. Transfusion was stopped at once, and she immediately developed what seemed to be a typical anaphylactic shock. The pulse became very small, rapid and weak; the breathing was labored; the face became a livid red. She complained of intense pain throughout her body, especially in the back. She retched but was unable to vomit because the stomach was empty.. She was given atropin, 1/100 gr.; 20 m. of adrenalin chlorid, 1–1000. Her feet were elevated and hot water bags placed around her. The temperature rose to 103.4, the pulse to 150. She gradually improved, and except for extreme weakness, was none the worse on the following day.

Whether or not this reaction was in any way beneficial, may not be known, but her blood picture began to improve gradually. Four months later the hæmoglobin was 70 per cent.; red blood cells 3,730,000. She felt perfectly well. The urine, quantitatively and qualitatively, was practically normal. In the attempt to explain this reaction, her husband's blood and her own were again compared with the same result as before. This case therefore showed a typical anaphylactic shock; the possibility of which could not be determined by the usual examinations upon which we rely to determine compatibility.

NEURITIS AND PERINEURITIS OF ARM

Dr. J. Stewart Rodman presented a patient, male, thirty-seven years of age. Admitted to Dr. J. H. Jopson's Service, Medico-chirurgical Hospital, April 25, 1922, complaining of pain in right arm. Previous medical history.—Appendectomy twelve years ago. Twenty-four years ago left leg severely crushed in railroad accident requiring amputation at middle third. Denies venereal infection. Present Illness.—On November 1, 1920, patient's right hand just above the thumb was burned with hot lead and zinc chloride. This burn was treated for the next eight days by usual applications. On the eighth day, tincture of iodine was used and a bandage applied. That night hand became markedly swollen, after which he applied hot magnesium sulphate. It was again treated locally for two weeks, at the end of which time an incision was made over the dorsum of the hand and pus was evacuated. Three weeks later, two incisions were made in the forearm near the elbow, pus being evacuated. One month later, an incision was made in the arm above the biceps and also over the shoulder-blade on the right side. From the start, pain in the right arm has been continuous. He has full motion but pain is severe.

Physical examination shows that left leg has been amputated, middle third; no scars other than operative ones on right arm and over right scapula. Teeth in poor condition, many missing, those present decayed, marked pyorrhœa. General examination otherwise negative. Examination of right arm shows marked inability to use arm or hand which, however, seems to be due to pain, which is greatly intensified on efforts at passive motion. There is tenderness in the arm and hand, but is not greater over the nerve trunks than elsewhere. No muscular atrophy, biceps jerk present. Tactile sense good. Pain sense is great in most places but in some smaller areas does not apparently feel prick of a pin, but these spots have no relation to the nerve supply. In the upper arm urticarial wheals appeared where stuck with pin, also hyperæmia about these areas. Skin is not smoothed out or shiny as one would expect from a neuritis.

Operation May 10, 1922, Dr. J. H. Jopson. Sympathectomy on right brachial artery. As no improvement followed this procedure, I was asked to see the case three weeks later. Suggested that a posterior rhizotomy might be considered. At the suggestion of Doctor Jopson, Doctor Spiller was also asked to see the patient, and he suggested that, instead of performing a rhizotomy, alcohol should be injected directly into the nerves responsible for the pain from which he suffered. In order to relieve his pain, it was necessary that the median, musculospiral, ulnar, and musculocutaneous nerves be injected. This matter was fully discussed with the patient, it being explained to him that a paralysis would result which would probably be temporary but might be permanent. The patient, however, was suffering from such extreme pain and had been for so long, that he eagerly welcomed anything that offered him relief. Accordingly on June 7, 1922, the median, musculospiral, ulnar and cutaneous nerves were exposed and 80 per cent. alcohol injected. This caused an immediate relief of pain and, of course,

complete paralysis of the forearm, wrist and hand. This relief of pain lasted for six weeks and returned with a return of function at that time. He was then admitted to the Presbyterian Hospital and on July 17, 1922, the median, ulnar, and musculospiral nerves were again injected with 80 per cent. alcohol after direct exposure. This time there was also an immediate relief of pain with paralysis of the forearm and wrist which has lasted to the present time.

Dr. Wm. J. Taylor remarked that in England in June of 1918, he had seen a good deal of this work which had been done at the nerve hospitals by Colonel Sanford and Colonel Buzzard. They used the method particularly in the treatment of causalgia; they cut down on the nerve to expose it and injected into the normal nerve above the wound whenever injury had been done to the nerve. They injected first 80 per cent.; other cases 70 per cent., and finally 60 per cent. alcohol, producing temporary paralysis almost without exception and some little disability. He had only had experience with two cases himself. One was a man in France who was shot by a rifle in the posterior tibia. The wound healed up and the man was apparently well, but suffered great pain. He had heard of the work of Buzzard, so he cut down on the nerve, and on exposing it found that the bullet had taken a piece out of the side of the nerve and a neuroma had grown over it. Being with the British, he would not have the right to do any nerve resection, so he injected him with 60 per cent. alcohol in the normal nerve about one inch above the neuroma. He had instant relief of his pain and discomfort, and went back to England, so he lost sight of him.

The second case was that of a young woman here in Philadelphia who got her wrist caught in a broken windshield, and was treated by a doctor who ligated the radial artery. Some time later she had a secondary hemorrhage which was stopped with pressure. She came to Dr. Francis Sinkler complaining of pain which finally extended up the arm, involving the posterior nerve roots. Doctor Taylor was extremely anxious about this patient, and on cutting down found the ulnar nerve and stump of the artery bound down in adhesions. The nerve was swollen and painful. The adhesions were loosened and 60 per cent. alcohol injected into the nerve itself. Paralysis of the ulnar nerve resulted with complete relief of all pain in the arm. She made a good recovery with complete return of all movement. It is nearly three years now and she is still well.

There are certain points in the question of technic. The nerve should be exposed absolutely. One should use the finest kind of a needle, and you must inject directly into the nerve itself, being careful in moving the needle about that it is fixed in the nerve and not between the nerve fibres. Inject slowly until you have distention. The nerve will look almost as if it were preserved in alcohol. The treatment has a limited application; you may have permanent paralysis; but where pain has been present for a year or two, and the pain and suffering is something indescribable, it seems to be worthy of application.

DOCTOR RODMAN stated, in closing, that it would have been much easier to have exposed the brachial plexus in the axilla and to inject that, but this was not done because a paralysis as high as that level was not desired. The pain was greatest in the forearm and in the wrist joint. This method was suggested by Doctor Spiller and while thought a drastic procedure, it seemed entirely justifiable in this case. The arm was held rigidly in a semiflexed position and the patient could not use it at all because of the extreme pain caused by motion. He did not want to give the impression that he believed this to be the first case in which alcohol injection had been done to relieve the pain of a neuritis, but rather that so far as he knew it is the first. The case is interesting because an entire group of nerves responsible for motion of a part of a limb have been deliberately injected with alcohol (80 per cent.) in order to relieve the pain of an ascending neuritis involving these nerves. A posterior rhizotomy was considered because it was thought by cutting the posterior roots of the cervicals, the 4th, 5th, 6th and 7th and the first dorsal, pain would be relieved but motion preserved. This was discarded because Doctor Spiller thought the fact that after such a rhizotomy the patient would lose all muscle sense and that this would make his arm useless and, of course, this would be permanent, whereas the effect of alcohol injection, although causing a complete paralysis for the time being, should be temporary. Posterior rhizotomy for various causes has been performed before in the cervical region by Abbey, C. H. Mayo and others so that there was ample precedent for considering this procedure. This patient can flex the elbow on the injected side and, of course, move the arm on the shoulder. He, however, has complete loss of sensation below the elbow joint and a wrist drop. On neurological examination made to-day, it was found that stimulation of the musculospiral, median and ulnar nerves, at and above the points of injection, does not result in any motor response with either current. There is the same result of stimulation of the nerves below the lesion. A stimulation of the motor points of the muscles of the respective nerves injected with the faradic current results in no response; with the galvanic current there is a sluggish hypo-excitable response with negative closing of conduction almost equal to positive closing.

This patient still shows, therefore, complete paralysis below the level of injection of the nerves in question, that he has had a complete surcease from the intolerable pain and is well satisfied with the result. Neurological opinion is that while six months approximately have elapsed since these nerves were injected, he is still well within the average time for reëstablishment of sensation and, therefore, has a reasonable prospect of regaining the use of the forearm and hand.

PERFORATION IN UTERO OF A GASTRIC ULCER

DR. WALTER ESTELL LEE and DR. J. RALSTON WELLS read a paper with the above title, for which see page 36.

ACUTE INTESTINAL OBSTRUCTION CAUSED BY MECKEL'S DIVERTICULUM

Dr. J. Stewart Rodman related the case of E. T., male, twenty-six, chauffeur, admitted to Dr. F. O. Allen's service at the Presbyterian Hospital, June 10, 1922, complaining of obstipation and pain in the abdomen. Present illness began with sudden severe pain in epigastrium about thirty hours prior to admission, having been perfectly well prior to this time. This pain has been constant and exaggerated periodically. At the time of admission it radiated from umbilicus to pubis and thence outward to each flank. Has vomited frequently since the onset of the pain. Seidlitz powder and magnesium citrate ineffectual as well as enemas for two and one-half days. Bowels usually regular. Examination negative, except for abdomen, which was tympanitic in upper portion. Dull below.

Peristalsis active throughout. Tenderness in hypogastrium and lower umbilical area. Pressure in iliac fossæ causes pain in hypogastrium. No masses. Rectal examination negative. Diagnosis: Acute intestinal obstruction.

Operation.—Ether anæsthesia. An incision was made in the median line between umbilicus and symphysis. On opening the peritoneal cavity a small amount of clear straw-colored fluid escaped. The small intestines were dark in color and distended proximal to a point in the right side of the abdomen where a large mass adherent to the posterior parietal peritoneum was felt. The bowel below this point was collapsed. On separating adhesions binding the mass to the posterior parietal peritoneum it was seen that a loop of small bowel had wrapped itself around and become firmly adherent to what proved to be a large Meckel's diverticulum. After freeing the bowel this diverticulum was found to be about 4½ cm. in length and about 2 cm. in width with two small diverticula at the distal end. The fluid contents were milked out of the lumen of the diverticulum into the bowel. It was then clamped across its base and removed with the cautery. The stump was closed with a through-and-through suture of No. 1 chromic catgut and covered over with a continuous Lembert stitch of linen. The abdomen was closed in layers without drainage. Recovery was uneventful.

Meckel's diverticulum while not a common operative finding is still not sufficiently uncommon to be considered any longer a surgical curiosity. Realizing that this condition was not so rare therefore as to warrant an exhaustive search through the literature, it was thought that it might be of interest to go over the Transactions of the Academy in order to find out how frequently Meckel's diverticulum has been reported as an operative finding before this body. This was done with the following result: In 1903, Dr. W. J. Taylor reported the first instance of this condition which appears in the transactions. His patient, a young woman of twenty, gave symptoms of acute intestinal obstruction and at operation a band was found constricting the small intestine about thirty-two inches from the cæcum. This band proved to be a remnant of Meckel's diverticulum. In 1907, Dr. J. B. Roberts reported three cases, one upon which he had operated, finding a Meckel's diverticulum causing

constriction of the small bowel and thus intestinal obstruction in a boy four and one-half years old. This case recovered. Of the two other cases a Meckel's diverticulum was seen during the course of an operation for another condition and one was found at autopsy. In discussing this paper, Doctor Gibbon cited three cases, one of which was causing intestinal obstruction, and Dr. W. J. Taylor referred to the case already cited, and mentioned one other upon which he had operated. No other instance occurs until 1914, when A. B. Gill reported a case of perforated Meckel's diverticulum with recovery. Seven years elapse until the next instance is recorded in January, 1921, by E. J. Klopp, his case being one of acute inflammation of Meckel's diverticulum. At the next meeting, February, 1921, E. T. Crossan and Don Lew, the latter by invitation, reported a case of acute intestinal obstruction from Meckel's diverticulum complicating acute appendicitis. At the last meeting, December, 1922, Dr. Damon Pfeiffer reported a case of perforated Meckel's diverticulum requiring resection of the intestine. In all, therefore, including my own case, there have been thirteen instances of Meckel's diverticulum reported to the Academy of which five caused acute intestinal obstruction.

Dr. Wm. J. Taylor stated that he had had one case of obstruction in relation to Meckel's diverticulum, which he reported at Johns Hopkins Medical Society meeting. He operated on a child four years of age for what he thought was acute appendicitis. On opening the abdomen a large mass was found, which he opened up, and found to be a Meckel's diverticulum twisted on itself three times, and strangulated. It was black and gangrenous and contained a number of grains of corn. It was cut off and the child made a good recovery.

PLEURAL EPILEPSY

Dr. Hubley R. Owen and Dr. A. Gonzalez (by invitation) read a paper with the above title, for which see page 6.

Stated Meeting Held February 5, 1923

The President, Dr. John H. Jopson, in the Chair

BULLET WOUND OF PREGNANT UTERUS

Dr. J. W. Bransfield reported the case of Mrs. L. T., age eighteen years, who twenty minutes before admission to St. Agnes' Hospital, April 28, 1922, accidentally discharged a revolver, the bullet striking her in the abdomen. She complained of a burning sensation with occasional cramp-like pains in her abdomen; no other discomfort. She stated she was about eight and a half months pregnant.

Examination showed bullet wound of entrance in abdomen 2 cm. below the umbilicus in midline. Uterus could be palpated and the fundus extended about 1 cm. above the umbilicus. The size of the uterus led me to believe that the patient was about at term and further questioning brought forth the information that she had been suffering from severe

pains of cramp-like character for the past twelve hours. He suspected she was in labor when injured. The point of exit of the bullet could not be found. Heart and lungs were negative. The patient was sent directly from the receiving ward to the operating room, and under ether anæsthesia, the abdomen was opened by a midline incision. The bullet tract through the abdominal wall was excised. The uterus was delivered into the wound. The intestines had escaped injury, being pushed upward by the pregnant uterus. The bullet wound in the uterus was found about 3 cm. from the crest. No wound of exit was seen. A Cæsarean section was performed and a living female child delivered. The placenta was practically detached from the uterus. The membranes had been ruptured.

The child was uninjured and normal in every respect. The bullet could not be found either in the placenta or in the uterus. The uterus was closed in the usual manner and the abdomen closed without drainage. Vaginal examination made with a view of dilating the cervix for drainage revealed the cervix to be practically obliterated. The bullet was lying free in the vagina. No injury occurred either to the cervix or vaginal wall. Both patients did well following the operation and were discharged from the hospital, May 23, 1922.

TRAUMATIC LESIONS OF THE HEAD

Dr. Thomas A. Shallow read a paper with the above title, for which see page 26.

Dr. Charles F. Nassau in the discussion of it mentioned that in the Mutter Lecture a number of years ago, he had compared the results of fractures of the skull treated by operative and non-operative methods, and had looked up twenty-four cases of fractures of the skull that were not operated upon, to compare with the histories of twenty-four operated cases. At that time, following the advice of Cushing, some surgeons were doing subtemporal decompressions in cases of subdural hemorrhage. He modified this by turning down a flap over the temporal region and, if necessary, creating a large skull defect, which gave free access to all bleeding. This was closed secondarily in from three to five days. He used a large Turks' head dressing, which was not disturbed until the secondary closure. Comparison of the immediate results was startling. In the twenty-four cases treated conservatively, the mortality was 79 per cent.; the cases which had been operated upon carried a mortality of 38 per cent. In other words, the mortality was cut in half.

He did not take the standpoint that all fractures of the skull should be operated upon, and questioned very much whether any surgeon is able to save many patients with bad fractures of the posterior fossa. However, in compound fractures of the base in the middle or anterior fossa, he was of the opinion that we would obtain very much better results if more of them were operated upon. It is the one way in which all compression may be relieved, and with proper post-operative conditions chances of infection are slight, even when closure is delayed. This procedure entails no great risk, and if there is a subdural clot, it should be evacuated. This method of treating subdural hemorrhage has been practiced for many years, and he believed

that too large a percentage of cases not so treated become epileptic or have some grave changes in mentality. These cases all bleed copiously, especially when any of the large sinuses are ruptured, but he had seen only one or two complete decompressions with fatal hemorrhage. With pressure relieved, the hemorrhage is almost sure to stop.

Within the past few months he had seen a child with Doctor Jopson, and they considered very carefully whether they should operate that night. The child was not operated upon, and he now has a partial paralysis of the fourth nerve. He did not believe that the non-operative treatment was responsible for his present condition. The patient had probably a slight hemorrhage into the nerve unrelievable by surgery.

Dr. J. S. Rodman thought that one of the primary difficulties standing in the way of a clear conception of the indications for treatment, conservative or operative, was the various ideas of the underlying pathology and symptoms of these various traumatic brain lesions which differ so widely. What is concussion to one is not so to another, and there seems to be no uniformity of opinion in this regard. He had come to look upon simple, uncomplicated concussion as a relatively slight injury which will invariably clear up on the conservative plan of management. In fact, he believed there should be no particular difficulty in separating concussion, contusion and acute compression. In this differentiation an estimation of the pulse pressure is exceedingly important and he believed it a good working rule to consider an equality between the pulse-rate and pulse-pressure as an indication for operative relief of tension. In so far as eye symptoms are concerned, of much greater importance to him than inequalities of the pupil are the fundus findings, especially on the side of injury, of paling of the optic disk and congestion of the retinal veins. There can be no question, he thought, that intracranial tension can better be relieved by a large bilateral opening of the skull than by the smaller opening of a subtemporal decompression. But he had come to feel that many of these cases are going to get well without any operative procedure and that some are sure to die in spite of any operative procedure. In those suitable for operation, he preferred a subtemporal decompression, bilateral if need be, inasmuch as the defects thus caused are amply protected by the temporal muscle. He believed it is a serious matter to create cranial defects in the parietal regions, since most of them must be closed later because of the disabling symptoms they cause.

Dr. Bernard B. Neubauer stated that in diagnosing acute head injuries we consider the determination of intracranial pressure a very important factor. We base our treatment a great deal on what the intracranial pressure reads when taken with the spinal mercurial manometer. If the reading shows a pressure of 10 to 12 mm. or below we treat palliatively. If below 16 to 18 mm. and above 10 to 12 mm. we treat by therapeutic spinal puncture and repeat in twelve hours and daily thereafter until reading by spinal mercurial manometer is within physiological limit. If the reading by manometer is above 16 or 18 mm. we remove 5 c.c. of spinal fluid slowly for laboratory use only and

do a subtemporal decompression with drainage. We do not do a therapeutic spinal puncture for relief in these cases, as compression of the medulla in the ring of the foramen magnum is too serious a condition to take such chances as it may cause medullary œdema and death.

Usually shortly after the operation for subtemporal decompression with drainage, the readings as shown by the spinal mercurial manometer are reduced. He did not remember seeing any choked disks in acute head injuries. If the cases having a high increase in intracranial pressure are allowed to continue without relief, they usually develop medullary œdema and die. If they do recover they usually show post-traumatic symptoms both physical and mental, which are very distressing.

They do not base the diagnosis and treatment on whether or not a fracture of the skull exists except in fractures of the vault. They feel that the determination of intracranial pressure in acute head injuries is very important. Injuries to the posterior part of the vault are usually most serious as they involve the medulla with its associate serious syndrome. Should an operation be advisable they do a suboccipital decomposition with drainage.

Dr. John B. Roberts thought that "concussion" should be left out of the list of surgical conditions. Histologically, there is doubtless such a thing, but if a patient does not regain himself quickly one should look into the brain to see what is wrong by neurological or surgical means at once. He believed he had obtained good results, in obscure injuries to the head, by reducing intracranial tension by means of early venesection associated with purgation.

Doctor Shallow in closing said he did not mean to give the impression that he believed in operating in every case. Two of the cases reported were not operated on. In reference to Doctor Rodman's remarks about the size of the decompression, one can go in and stop the hemorrhage if there is any. He had seen subdural decompressions which were not sufficient and had done as many as four decompressions. One can determine the extent necessary at the time of operation. Whether pressure causes the epilepsy or not, he was doubtful, but it hardly seemed so, as in that event every case of brain tumor would have it.

These cases should be operated on within a number of hours, before they get their optic atrophy and choked discs. One might as well go on and follow the conservative treatment, if you wait for all these symptoms to develop. He thought that careful study with the ophthalmoscope was impossible in these cases. His observation is to determine at once what is the best thing to do if the patient does not come back to consciousness. If it is the quiet form of unconsciousness one can take some risk. If one does a lumbar puncture and finds hemorrhage it indicates a subdural hemorrhage.

TRANSPLEURAL ŒSOPHAGO-CUTANEOUS FISTULA

Dr. Alfred Hand and Dr. Walter E. Lee reported the case of L. L., two years of age, male, who was admitted to the Children's Hospital with the history of having caught cold July 4, 1922; who on examination

presented the typical physical signs of a consolidation of both left lobes of the lung. On July 16 changes in the physical findings led to the inference of fluid being present and on exploratory aspiration, cloudy fluid was withdrawn from left base in posterior axillary line. Patient was transferred to the surgical ward July 17.

Operation under local novocaine anæsthesia. Incision in eighth interspace, left chest, posterior axillary line. No rib resection. A foul-smelling, thin, purulent material was liberated on opening into the pleural cavity, to-and-fro suction through the wound very marked. Rubber tube inserted just to the inside of the pleural cavity and fixed by silk.

After operation child did well, not seeming to suffer from any shock; hourly dressing. Drainage continued profuse, but on July 20th a change was noted in its character, it having become more profuse, and white and

FIG. 1.—Showing œsophago-pleural fistula.

FIG. 2.—Showing fistula closed.

flaky in appearance, having an odor of sour milk. On the following day it was noticed that immediately after the ingestion of fluids there was a more active discharge from the chest opening, smelling like sour milk. An X-ray after a barium meal showed a communication between the œsophagus and abscess cavity (Fig. 1).

The Rehfuss tube passed into the stomach was not well tolerated, although the thoracic discharge lessened. On July 24, after forty-eight hours, the tube was withdrawn on account of extreme restlessness and passed through the nares. X-ray at this time showed the left lung almost completely expanded. On July 28, after tube feeding for six days, it was discontinued because of irritation to nares and ingestion of semi-solids, but little or no liquids allowed. No passage of food through the fistula was noticed. This impression was confirmed from X-ray examination on August 12. The child rapidly improved in strength and appearance, the discharge greatly decreased and became less foul. On August 20, drainage tube removed. On August 28, a confirma-

tory X-ray showed the fistula apparently closed (Fig. 2). On September 6, discharged from hospital; incision almost healed; very slight discharge; condition excellent.

Readmitted October 18, 1922 (about five weeks after discharge). With an abscess at the site of the old thoracotomy opening, incision of which liberated a large amount of foul-smelling pus. On October 25, two ribs (eighth and ninth) were resected, and a well walled-off pocket of pus about three inches in depth was found and evacuated, which after draining normally for eighteen days closed and patient was discharged cured.

Doctors Ballin and Saltzstein, Detroit, Mich., have published a thorough and comprehensive article on this subject. They report seven cases, including their own. Since that time reports of œsophageal perforation into the trachea have been made by Forster, Miginiac, Menne and Moore; two being of malignant origin and one of rupture, the latter being due to sudden internal pressure (violent vomiting of a solid curd of milk). There was no suggestion of a preceding inflammatory condition in this case. Of a transpleural œsophageal fistula, Fonte reports one, probably luetic. Necropsy showed perforation two cm. above the cardia into the pleura. This report includes a second case, that of a true transpleural œsophageal cutaneous fistula, male adult, recovery after two years three months suppuration; several operations were performed with negative results; cure was apparently spontaneous. The diagnosis was confirmed, late in the course of the disease, by the patient tasting the fluid that was injected into the pleural cavity—probably a gastric regurgitation having first passed into the stomach through the fistula and thence to the mouth. In this case there was a history of a contusion of the left thorax two months before the pleural focus was diagnosed. Whether this had any relation to the resultant condition we are unable to state.

If one takes the various possible causes or the etiology of this condition, only two seem possible in this case, namely, acute œsophagitis and ulceration, or a tuberculous condition resulting in ulceration, and second, a local pleural inflammation and ulceration into the œsophagus. Of the above two etiological possibilities one cannot state one or the other with positiveness, but owing to the relative short time necessary to effect a cure, they are rather of the opinion that it was not of a tubercular origin.

Considering the œsophagus anatomically and remembering its relations to the trachea, vertebræ, aorta and bronchus and examining the accompanying X-ray plates, we are led to believe that our perforation occurred at approximately its second anatomical constriction, or in other words, at the point where it is crossed by the left bronchus at the level of the fifth thoracic vertebra. Here it is deviating to the left and is in contact with the left pleura. An ulceration from the pleura might well perforate through into the œsophagus. That the ulcerative process did not occur primarily in the œsophagus may be deduced from the fact that it was not until several days after operation, and considerable time after thoracic symptoms developed, that food

material was seen or suspected in the discharge. That the fistula was not caused from irritation of the thoracotomy drainage tube, may be dismissed by the fact that the tube inserted was of sufficient length to penetrate into the pleura not over one cm. Also, if the ulceration and perforation had occurred previous to operation, the drainage would have been into the œsophagus and a resultant vomitus of a pus material would have ensued; therefore we are led to believe that a local suppurative pleurisy ulcerated into the œsophagus at its closest point to the pleura, the pleura being drained through a thoracotomy opening.

Treatment.—Two main points are to be borne in mind, one, maintenance of sufficient nutrition for the patient, and second, the reinfection and constant irritation of the pleura by the traversing of the ingested food to the cutaneous surface. Of the two the maintaining of sufficient nutrition is probably the one to concern us most, providing sufficient facilities have been made to adequately drain the pleura of its infected material and food coming through the fistulous channel. The Rehfuss tube is the method of choice to overcome both conditions, but as in our case, the patient not bearing this treatment well, resort must be made to other means. Rectal alimentation or gastrostomy may be used, but the simple method of giving the more solid foods (junket, custards, etc.), providing the perforation is not large, is the least complicated and was apparently effectual. If the fistulous opening into the œsophagus is large or is at the base of a diverticulum having a wide opening, the method we used would be of little avail in overcoming the two points mentioned. The Rehfuss tube passed readily into the stomach and there was apparently no pouching or diverticulum present.

The return of the patient for drainage of the local abscess and treatment of the necrosed ribs at the site of the thoracotomy, we do not consider as part of the condition of perforation of the œsophagus, but rather a local sequela of the thoracotomy.

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BRONCHO-SUBPHRENIC-CUTANEOUS FISTULA

Dr. Astley P. C. Ashhurst reported the case of a man about thirty years of age, who came under his care in the Episcopal Hospital thirteen years ago, with a history that about three years before he had had some venereal disease, apparently chancroids. About six months before coming under observation, he began to have pains in his back. A few weeks before admission to the hospital he had developed a cold abscess in the left lumbar region; he was admitted to the ward, put on a Bradford frame, with extension; but as the abscess did not improve, and as he had fever and other evidences of secondary infection, and as

there was no evidence of vertebral disease, it was decided to open the abscess and drain it. When opened it was found that it surrounded the kidney which appeared to be normal. The cavity extended down toward the crest of the ilium. Doctor Ashhurst thought it came from infection of the retroperitoneal tissues ascending from the genitals. The patient convalesced but the sinus remained. He was under observation subsequently in the dispensary, but after two months, as the sinus remained unhealed, some bismuth paste was injected into it, whereupon the patient became blue in the face and the paste came out of his mouth. After a few days the bismuth injection was tried again, because it was desired to find out whether it came out of his stomach or his lungs. The second time the patient was sure it came from his lungs. He apparently had a subphrenic abscess communicating in some way with his bronchus. After several injections the amount of bismuth paste which passed through to his mouth gradually diminished and the sinus healed up. One year later he was seen again with the skin lesions of tertiary syphilis, which cleared up under treatment. He appeared to be well and had no sinus. Cases of long and tortuous fistulous communications of this kind are apparently comparatively rare, and it is remarkable how insidious the disease may be in its onset and yet the patients recover with so few complications.

IMMEDIATE PLASTIC OPERATIONS IN INJURIES INVOLVING TENDONS OR JOINTS

Drs. G. M. Dorrance and J. W. Bransfield discussed this subject by stating that in traumatic surgery, the object is to restore the injured workers to the same or some equally useful occupation. In other words, surgeons who fail to do constructive surgery are amiss in their duty towards the patient.

The experience gained in the war in debridement of wounds, primary suture, mechanical cleansing of wounds, and late plastic surgery have been of inestimable value in caring for traumatic cases.

The uniform success obtained with pedicle flaps in late cases where the infection had not entirely cleared up, led us to believe that the increase in blood supply brought to the parts, plus the pouring out of the blood spasm and lymph, might be a factor in the healing of these cases. In all events, the infection did not appear to prevent the flap from taking.

Exposed tendons or joints, especially in crushing injuries, do poorly. They are likely to become infected and later slough. Antiseptic dressings are prone to destroy the linings of joint cavities, tendon sheaths and tendons.

They are confident that they have found a means which helps, at least in part, to overcome the difficulties encountered, and have seven cases where pedicle flaps were used immediately to cover exposed tendons or joints. In all joint cases, the rules laid down by Willems were carefully observed.

The cases shown illustrated the three most common types encountered. 1. Exposed tendon and joint in a finger. 2. A palmar injury with superficial flexer tendons exposed. 3. Compound fracture with joint opened and superficial extensor tendons exposed. All of these cases, if treated by the usual

surgical procedures, would require plastic operations later, as there was a distinct loss of skin and superficial fascia. In the event an immediate flap had not been used, marked contracture and deformity would have occurred due to the contracting cicatricial tissue. In the third case cited above, amputation of the forearm was seriously considered, as the skin and superficial fascia had been torn off over an extensive area. Tendons were exposed and the wrist-joint opened, both bones of the forearm were broken and the fracture of the radius was compound.

The technic is the same as that employed in constructive plastic surgery of the hand. An abdominal flap is raised, using parallel incisions. The bed from which the flap is raised can usually be covered by undermining the surrounding skin. (Fig. 1.)

FIG. 1.—Showing preparation of abdominal flap.

The potentially infected hand or arm after careful mechanical cleansing, followed by the surgical removal of all devitalized tissue, is placed under the flap, the edges of which are sutured in place. (Fig. 2.)

While preparing the abdominal flaps, they have placed the injured hand or arm in 1 to 50 hypochlorite solution. Local suppuration may occur at the margin of the wound, but will respond to the usual treatment. They have not lost any tendons through infection. In none of their cases have the tendons been divided by the injury. If this had occurred, they would not do an immediate suture.

They feel confident that the method offers something worth while in preserving tendons and joints in these cases. They have not had a sufficient number of cases to recommend it as a universal procedure. Modifications of the technic may have to be made from time to time.

Conclusions.—1. In traumatic injuries with loss of skin and superficial fascia, with tendons or joints exposed, a pedicle flap used immediately appears to preserve the tendons and joints from infection and prevents loss of tissue.

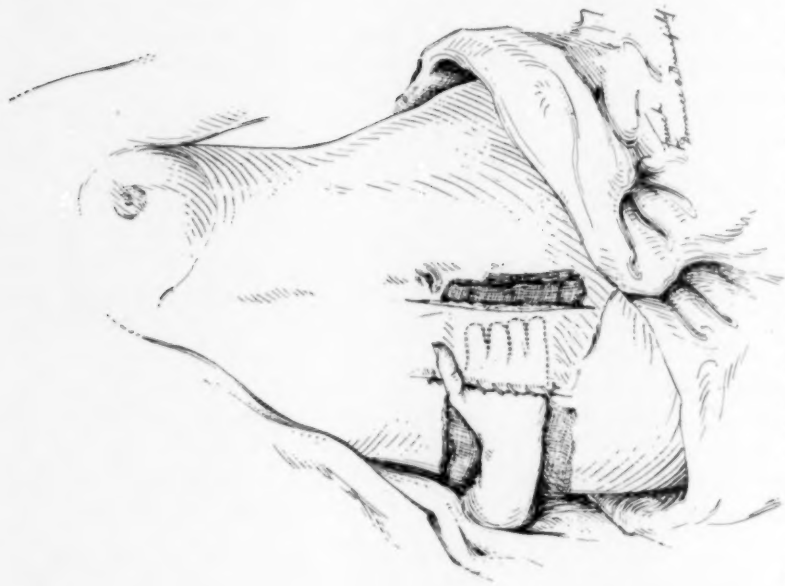

FIG. 3.—Showing injured hand sutured to flap of abdominal wall. Gauze dressing between forearm and abdominal wall.

FIG. 2.—Showing position of parallel incisions and method of undermining in order to close skin beneath flap.

2. Deformities due to scar-tissue contractures are avoided and the length of time in the hospital is appreciably lessened.

3. Traumatic injuries of this type are given a better chance for a functional result.

4. Amputation may be avoided by early plastic operation.

Dr. DeForest Willard thought this idea of putting the skin immediately over the joint wound a good one. This procedure should enable one to start early joint motion in those cases where there is a considerable amount of open wound. This probably applies also to the tendons. If the tendon sheaths are still good, he thought immediate skin graft was not so important, but if open, a graft with fat underneath will be a distinct addition to the surgery of traumatism.

Dr. A. P. C. Ashhurst stated that for years surgeons had turned in flaps from the neighborhood of recent wounds, where the local conditions demanded; but taking pedicled flaps from another region of the body in such circumstances is not a recognized procedure. And certainly, in the case of the woman shown, he thought as good a result could have been secured by sacrificing the two outer metacarpals, which are of no use to her anyway, and then using the skin which covered them as a flap to cover in the denuded ends of the first and second metacarpals.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY

Stated Meeting Held February 28, 1923

The Vice-President, Dr. Eugene H. Pool, in the Chair

CHRONIC HYPERTROPHIC VILLOUS ARTHRITIS OF THE KNEE

Dr. H. E. Santee presented a patient, thirty years of age, male, admitted to Bellevue Hospital, August 15, 1921, who had noted four months previously a moderate swelling above and medial to the right patella which in the course of two months attained its maximum size. Never red or hot, and accompanied by very slight pain. Entire leg felt tired and heavy. Shortly following the onset of the condition, a swelling appeared lateral to the patella. Three weeks previous to admission, the joint was aspirated by a physician, and three cups of blood-tinged fluid were removed. Patient can recall no trauma as the cause of this condition.

As possibly relevant, the patient had had acute rheumatic fever in 1906, involving many joints, principally the right knee, which incapacitated him for one year. Similar attacks yearly of this swelling in the right knee, lasting a few days, but subsiding without treatment. Negative as to tonsillitis, pyorrhœa, gonorrhœa, or septic infection of any kind. Physical examination was negative, except for the surgical condition. The right knee-joint is markedly swollen, distending the synovial quadriceps cul-de-sac, extending to a distance of four to five inches above the patella; similar distention on either side of the patella and the patellar ligament. The joint is evidently markedly distended with fluid. Motion in the joint is painless, complete. The overlying skin shows no redness, is apparently normal. No definite points of tenderness made out except possibly over the internal cartilage. Palpation gives a slight doughy feeling, with a definite patellar click. The palate and pharynx are congested, the tonsils not visible. The heart and lungs are negative. During the stay in the hospital, the joint was aspirated, and a serous fluid obtained admixed with blood. A smear showed eighteen lymphocytes and two polymorphonuclears to the field. No organism seen. The culture was negative. A guinea-pig was injected with the fluid, and was alive after four weeks. No tubercle bacilli found in this fluid.

An X-ray of the chest on August 29 showed a small calcified area in the right lung. The teeth were negative for foci of infection. The knee-joint, No. 109954-5, showed joint spaces of moderate width, articular surfaces regular. Diagnosis, chronic synovitis. The urine was negative, Wassermann negative. Prostatic massage gave no evidence of chronic infection. Temperature normal. The patient was advised

to have exploratory arthrotomy, but refused, and accordingly was sent to the out-patient department for observation. The treatment was aspiration and a pressure bandage.

Six weeks later, in the Return Clinic, November 6, the knee showed a moderate amount of fluid. A superficial ulceration about ½ cm. in width marked the site of aspiration. No change in the general condition. Patient was not seen again until March 26, 1922, when he again applied to the Clinic, with the history that his knee trouble had continued. Had been working, but with some disability, due not so much to pain as to a feeling of heaviness and instability of the knee. The swelling has continued intermittently, more marked at times, but always present. Knee was aspirated two or three times by private physician. Readmission on March 26, 1922. Physical examination same as on previous admission, except that swelling extends somewhat further. An X-ray, March 30th, No. 135461-62, shows a moderate effusion in the right knee. No evidence of osteoarthritic changes. In view of continued disability, the patient desires an operation. Diagnosis here was considered in view of the previous evidence to be hypertrophic villous arthritis, with second choice as tuberculosis, mainly synovial.

Procedure.—On April 3, 1922, under gas and ether anæsthesia, with tourniquet applied, longitudinal skin incision from seven inches above patella to patellar ligament attachment to tibia, slightly external to midline, deepened to quadriceps tendon, patella and patellar ligament. Incision through quadriceps tendon and patellar ligament and a longitudinal splitting of the patella about one-half inch internal to the skin incision, the patella being sawed through. This gave most excellent exposure to the synovial lining.

Gross Appearance.—The bursal expansions of the knee-joint were the site of a chronic inflammatory thickening, the inner aspect of the bursæ and the whole synovial lining presented a reddened appearance as of chronic granulation tissue without, however, appearance of calcific deposits nor any joint mice. The joint fluid was hemorrhagic, serous in character. No erosions of cartilage were made out over the articulating aspects of either femur or tibia. About the heads of the bone corresponding to synovial attachment, the cartilaginous portions showed a small rim of rather hemorrhagic discoloration.

Beginning above the entire bursæ and synovial lining were dissected free from the surrounding tissues, first in the sub-quadriceps portion, working laterally to either side of the joint line proper, the entire synovia being removed in one piece, but with perforations where attached to bone. Joint was irrigated with saline and tourniquet removed. Hæmostasis effected as completely as possible, although complete hæmostasis was not accomplished. The quadriceps tendon was then united above with interrupted chromic sutures, similarly the patellar ligament, thence a row across the anterior surface of the patella. All bloody fluid was then expressed from the joint proper as completely as possible. Skin and subcutaneous tissue closed with interrupted sutures. No drains. Dry sterile with pads about the patella so as to

produce pressure moderately about the peripatellar vacant spaces in the joint proper where dissection had been done. Moderately firm bandage.

Following the operation the patient ran a temperature from 100 to $101^{3}/_{5}$, with marked pain in the right knee and considerable superficial redness about the incision. On the sixth day all sutures were removed. The skin wound was slightly separated about four inches above the patella and just below. A few drops of seropurulent fluid drained out. Culture of this was sterile. Under this procedure and with wet alcohol dressings, the temperature subsided and has been practically normal since the seventh day. On the tenth day passive motion was begun in the right knee, at first limited to ten degrees, gradually increased. Beginning active motion after the seventeenth day. Up and on crutches after the third week. The small incision and opening above the patella was completely healed, the opening below the patella still exuded some pus, with slight superficial necrosis of the patellar ligament.

The specimen removed showed the synovial membrane of the knee-joint with suprapatellar bursa. The inner surface presented innumerable villi from 2 to 5 mm. in diameter. These and the membrane between were yellowish-brown in color. Adherent to these were some soft structures resembling white thrombi. Around the outside there was considerable adherent fibrous tissue. The thickened villi and synovia are built up of cellular tissue, constructive, rich in fibroblasts and well vascularized. Beneath the superficial layer are large numbers of cells loaded with golden-brown pigment in granules. Attached to the inner surface are layers of fibrin and leucocytes. No evidence of tuberculosis. Diagnosis: Chronic synovitis with overgrowth of villi and considerable pigment deposit, possibly from hemorrhage.

Dr. Royal Whitman considered that in cases of chronic synovitis in which, as in this case, the granulation tissue had not invaded the cartilage, it is unnecessary to remove the entire synovial membrane as a thorough scrubbing of the interior surface with gauze seems sufficient to stimulate repair.

Doctor Santee replied that this procedure had enabled a complete inspection of the joint itself. The entire synovial lining down to the head of the tibia was removed, but in certain small parts some of it was doubtless left, though there was no evidence of this at the time of operation. There might be a question whether this patient's condition was of tuberculous origin, but this was fairly well disproved; the other possibility is a mild streptococcic origin along with the acute rheumatic fever from which he suffered in 1906.

FRACTURE OF PATELLA AFTER ARTHROTOMY

Dr. H. E. Santee presented a second case. A male, age thirty-six, admitted to Bellevue Hospital, December 4, 1922, who three and one-half months previously suffered a dislocation of the left internal semilunar cartilage.

Operation, December 6, 1922. With tourniquet applied a longitudinal incision seven inches long was made through skin, quadriceps

and patellar ligament. Patella exposed and sawed through in line of incision just to mesial side of centre. Knee-joint exposed and flexed. The synovia looked normal. No areas of erosion of cartilage over femur or tibia. The internal meniscus was ruptured incompletely at junction of anterior third with posterior two-thirds, attached around margin. On flexion and extension of knee it would bunch up in a small mass toward the intercondylar notch. No other pathology. The internal semilunar cartilage was removed through line of rupture. Stitches were then taken with interrupted chromic gut closing quadriceps tendon above and patellar ligament before removing tourniquet. Tourniquet then removed, moderate oozing. A line of interrupted chromic sutures then taken over anterior aspect of patella, wound approximated nicely. Fascia overlying quadriceps brought together with interrupted plain gut. Skin and subcutaneous fat closed with continuous silk. Dry dressing.

Three days after leaving hospital (thirty days post-operative) patient slipped with left leg in extension. He suddenly felt excruciating pain in the left knee. Could not walk or stand. Knee became very swollen. On admission to hospital, January 5, 1923, his left knee was tremendously swollen, ecchymotic, and exquisitely tender. There was evidence of marked effusion into the joint with considerable periarticular effusion or hemorrhage. All manipulation and pressure is very painful. On deep pressure there is tenderness transversely across the patella. Div. X-ray No. 2127, taken immediately, showed complete transverse fracture of patella with some comminution. Line of fracture at junction of upper one-third and lower two-thirds. Small independent fragment external and above. Owing to marked pain and discomfort knee-joint was aspirated with removal of two and one-half ounces of thick bloody synovial fluid, with immediate relief.

Operation, January 15, 1923. A curved transverse incision with convexity downward about one-half inch below line of fracture of left patella. Dissection upward over anterior surface of patella periosteum. Line of fracture exposed with the lateral extension on either side. Small irregular tear one-half inch in extent in either lateral extension. Patella itself separated about one-half inch. Line of fracture transverse through thickness of upper one-third with lower two-thirds; independent fragment through external portion of upper fragment, but not apparently through old line of median split patella operation. Marked hemorrhage into knee-joint with old clot. Some hemorrhage into soft tissues about joint. The periosteal covering of the patella was rather thickened and œdematous so that sutures, especially through the lateral portion of the anterior covering, were difficult to place without tearing out. One mattress suture—through lateral extension on either side of patella. One interrupted suture close to patella on either side and a row of interrupted sutures across anterior surface bringing the fragments in as close apposition as possible. Apposition was close throughout inner two-thirds of fracture line, about one-fourth inch separation through outer third. Fine kangaroo tendon used throughout. Skin closed with layer of subcutaneous plain gut. Skin itself closed with continuous silk.

Post-operative course uneventful. On twenty-fifth day passive and active motion instituted gradually. The peri-articular thickening apparently subsiding. Five weeks post-operative the mobilization of the joint progressing fairly well. Active motion from complete extension ranging to 80° flexion. Passive motion to practically a right angle. Hospital X-ray, 2-24, No. 28733-4, shows old fracture left patella just above middle, with some irregularity at line of fracture on articular surface and some rarefaction of fragments.

FRACTURE OF FEMUR. PLATE IN SITU AFTER EIGHT YEARS

DR. CLARENCE MCWILLIAMS showed a boy, now twenty-three years of age, who sustained a simple oblique fracture of the right femur running from above down, in the middle third, eight years previously. There was shortening of two inches (Fig. 1). A Buck's extension was applied, but no amount of weight overcame the shortening. After five days under anæsthesia on a Hawley table, a plaster case applied from the sole of the foot up around the abdomen. An X-ray showed that the over-riding had not been overcome. On the eighth day a vanadium Lane plate was applied with six screws after releasing the upper outer fragment from its being imbedded in the muscle. The dove-tailing was very accurately accomplished (Fig. 2). A plaster-of-Paris spica was applied and union was by first intention. From the X-rays taken a week ago, it is seen that the plate is in good position; there is no absorption of bone about the screws nor is there any shortening (Fig. 3).

He stated that he did not remove Lane plates until there was some sign of irritation, except in case it is applied to the radius and ulna. In this situation the plate weakens the bones, and renders them more susceptible of subsequent fracture. Suspension and traction now being the standard method of treating fractures, makes Lane plates almost entirely unnecessary. Almost any fracture of the femur can be successfully handled by this method and in re-treating this patient suspension and traction would have been used. Failing to obtain good position with this method, he would cut down upon the fracture, release the bone from the muscle, and close the wound without applying a plate, using then traction and suspension. The disadvantage of a plate, outside of liability to infection, which is great, is that one must apply a plaster splint. This causes a very stiff knee which takes months to overcome. This is not the case with the suspension and traction method of treatment.

SARCOMA OF TESTIS

DR. WILLIAM B. COLEY presented a patient S. S. S., forty-two years of age, who was operated upon for sarcoma of the right testis by Dr. M. J. Seelig, of St. Louis, in 1902. A diagnosis of round-celled sarcoma was made at the University Laboratory and sections of the tumor sent to Doctor Concilman of the Harvard Medical School, who confirmed the diagnosis. The patient remained well until two or three years prior to 1919, when he had occasional attacks of cramps in the groin on the right side. It was thought at first that the condition might be due to chronic appendicitis. He went to the Mayo Clinic in May, 1918, and

FIG. 1.—Oblique fracture of middle third of femur. Shortening of two inches.

FIG. 2.—Result after open operation which consisted in releasing the upper end of the lower fragment from being caught in the muscle. Application of a six screwed vanadium steel plate. Perfect reduction.

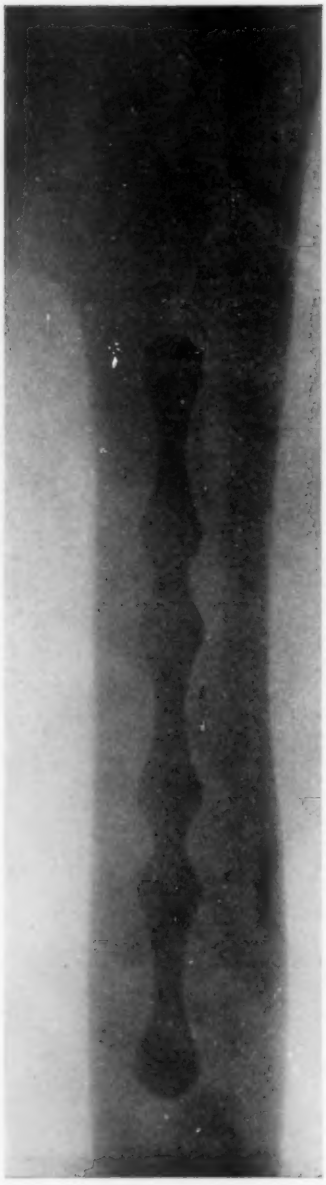

FIG. 3. — Result after eight years. Perfect alignment, no shortening, no absorption of bone caused by the screws.

their physical examination report at that time reads: "The large tumor in the abdomen is probably a recurring sarcoma, involving the deep glands along the spine. This growth apparently is not attached to any organ. General condition good." He was treated with X-ray and radium at the Mayo Clinic, under which the tumor subsided considerably. Shortly after returning to his home the tumor again began to increase in size, his abdominal symptoms recurred, and another tumor developed in the left supraclavicular region. The patient was referred to the speaker for advice and treatment.

Physical examination at this time showed a large tumor in the right lower abdomen, apparently retroperitoneal metastasis, from the primary tumor of the testicle. The left supraclavicular region was occupied by a tumor about the size of a hen's egg, apparently another metastatic growth from the primary sarcoma of the testis. Doctor Coley stated that he had seen four cases of metastases in the left supraclavicular region following a primary sarcoma of the testis. The explanation for this, no doubt, is that the thoracic duct which drains the abdominal and lymphatic glands, empties into the left subclavian vein.

The patient was admitted to the Memorial Hospital and treated with systemic injections of the mixed toxins alone. After two weeks' treatment the mediastinal tumor had diminished to one-third its original size and the tumor in the abdomen had also decreased appreciably. He was then given a massive dose of radium over the left abdomen, and a radium pack was placed over the left supraclavicular tumor. In about three weeks the supraclavicular tumor had entirely disappeared and the tumor in the abdomen had steadily increased in size. The patient then returned to his home, where the toxins were kept up for six months, at the end of which time he returned for further radium treatment. Examination then failed to reveal any tumor mass in the abdomen or supraclavicular region. Another radium treatment was given over the abdomen, and the toxins were further continued. He has come on for observation every six months during the first two years, and just once during the last year.

The patient remained well until January, 1923, when he was seized with what was taken to be an attack of grippe, with some pain in the right chest, but very little temperature. Dyspnœa developed shortly afterward and increased rapidly. Two weeks later, on arrival at the hospital, his dyspnœa was so great that he had to have an immediate aspiration. Two quarts of chocolate-colored fluid, slightly tinged with red, were withdrawn from the right chest. With the previous history of recurrent sarcoma of the testis, it was naturally assumed that a metastasis had occurred in the lung. The X-ray, however, was negative. Within five days the chest again filled up and dyspnœa became marked. A second tapping was done and two and one-half quarts of similar sterile fluid withdrawn this time. Three other aspirations were performed at intervals of three to four days, the last one three weeks ago, on February 7th. At the last aspiration seven pints of fluid, similar in character to the earlier aspirations, were withdrawn. The lungs did not

refill after the fifth aspiration. The patient quickly regained his strength and a recent X-ray examination again shows no evidence of metastases. In view of this fact, together with the sudden onset of the trouble, immediately after exposure to the grippe, Doctor Coley stated, they felt constrained to conclude that they were dealing rather with an unusual type of pleurisy following grippe, and that the condition had no relation whatever to the patient's former malignant tumor.

DOCTOR LILIENTHAL expressed his confidence in this serum by using it, in some cases, in preference to X-ray or radium, especially in lymphosarcoma. In cases in which there are metastases, or in those of sarcoma of the long bones, he had seen Coley's fluid successful and the patients get well. Only a few days before he had received a letter from Doctor Coley telling him of the recovery of a patient referred for this treatment who had osteo-sarcoma of the tibia. It was *not* a giant-celled tumor. The mass had been extirpated by Doctor Lilienthal with the idea of its being non-malignant, but the pathological report contradicted this. He had felt that radium in a case of this kind would be worse than useless and had preferred to try Coley's fluid instead. That was one year and a half ago and there had been no sign of recurrence.

USE OF METAL PLATES IN THE TREATMENT OF FRACTURES OF THE LONG BONES

DR. ALFRED STILLMAN read a paper with the above title, for which see page 75.

DR. JAMES M. HITZROT thought that among the real reasons for the present unpopularity of the steel plate are the selection of improper cases for their use, and the use of plates by surgeons who did not know how to use them properly. If a plate causes trouble it is quite safe to say that it has not been put in properly. Another important point is that if a plate is used after every other method has been tried and failed and the result of the use of the plate is also a failure, the blame is placed upon the plate which is not fair. If a plate is to be used, a decision to do so should be made early. Operation upon late cases is unsatisfactory, and if plates are used infection and other troubles are more apt to occur. In the healing process, osteoid tissue, becomes fairly well established along the line of fracture between the eighth and twelfth days. If a plate is to be used it should be used before this tissue has become established, namely before the twelfth day.

He had had one death and four infections in over one hundred cases in which the metal plate was used. Most of his trouble with plates occurred in the tibia and humerus. He did not remove the plate unless there was some indication for doing so, and he had several cases which have carried plates without trouble for eleven years. Nine plates had been removed; infection one case, screws pulled out four cases (three of which were not properly applied and wood screws were used), pain in the region of the fracture two cases (in these the plates were densely imbedded in bone and

no cause for the pain could be found at the time of removal, the pain however disappeared), rarefaction of the bone in the region of the plate one case (the plate and screws lay entirely loose in dense scar tissue). One plate was removed at the patient's request. None had to be removed which he had personally applied for non-union, although in some half dozen cases in which the patients had non-union, he removed plates which had been applied elsewhere.

With regard to the complete supersedence of the use of the plate by skeletal traction, he did not believe that a plate should be used when traction or any other method would give the desired result. The plate is a special method for special cases, properly selected, and should only be used by surgeons specially trained as to the pitfalls in its application. With regard to stiffness in the joints after the use of the plates, he showed a special type of brace or splint before this society in 1912, with a ratchet at the hip and knee which allowed for motion at the knee, and he saw no reason for a stiff knee if intelligent after-treatment was carried out.

Dr. Howard Lilienthal said that in the treatment of fractures absolute fixation is nearly always necessary, and there is nothing which will accomplish this better than the Lane plate, but the plate remaining in too long does do harm in certain cases. It is a foreign body. In the second place, no matter how firmly the screws fit in the bone, there is no bone where the screw hole is which is not likely to break at this point, even when the screws are in place. If the plate is taken out these holes will eventually fill with bone. The speaker described a plate which he has devised with screws which protrude from the bone and stick out of the wound. At the end of four to five weeks where there is enough fixation to hold the bone with plaster-of-Paris, the screws are removed and the plate pulled out by means of an attached piano wire. He had treated nineteen cases in this way, but the wounds in the compound fracture cases when thus plated were left wide open and treated at once by Carrel's method. He strongly urged the use of this method in gunshot wounds of the femur as the first operation. The important thing was that one had a large wound, one had performed a debridement, put in the plate, and immediately started Carrel-Dakin treatment. By iodizing these cases a possible gas bacillus getting in with the screws is avoided. In recent cases a clamp or plate should be used, but there should be metallic fixation. In compound fracture cases, the very ones in which Lane said the plate should not be used, there is less risk from using it.

CORRESPONDENCE

LYMPHO-SARCOMA OF THE TONSILS WITH CERVICAL METASTASES

EDITOR ANNALS OF SURGERY:

Sir:

The case reported below is as unusual in its pathology as fortunate in the apparent result, following extensive surgical interference and post-operative radium treatment.

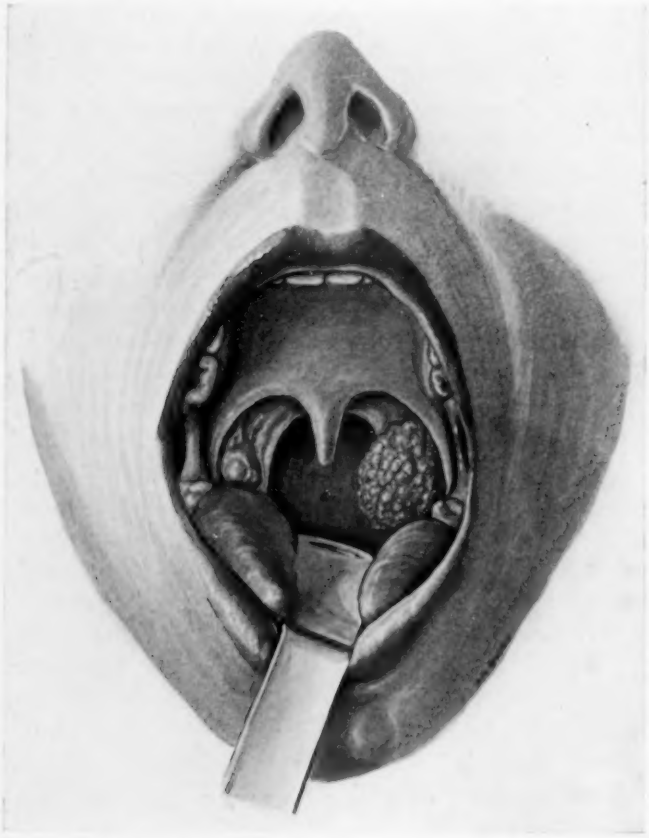

FIG. 1.—First appearance of the disease upon the tonsil.

A review of the literature upon malignant disease of the tonsil fails to reveal any case of cure where metastasis to the neck had occurred. Dr. M. B. Tinker in May, 1922, in a paper before the American Surgical Association, said that so far as he had been able to determine there had been no recoveries but spoke of a personal communication from Dr. E. A. Codman, in which the latter recorded a recovery from extensive carcinoma of the jaw with neck involvement after intensive radium treatment. The majority of these cases of tonsillar and pharyngeal cancer are seen so late that with the rich lymphatic drainage from the tonsil especially, extensive submaxillary and cervical extension has occurred even when the lymphatic nodes are not greatly enlarged. Hence the necessity in a dissection of the neck for malignancy that not only all appreciable disease be eliminated but that a dissection starting often as low as the clavicle should by the block method and

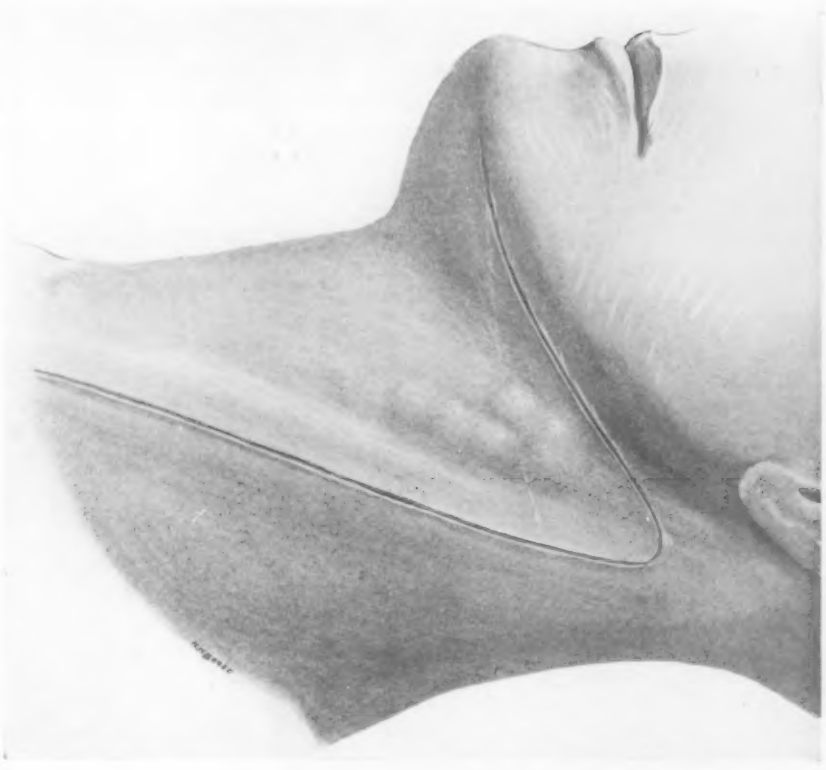

FIG. 2.—Line of neck incision, actually carried somewhat higher.

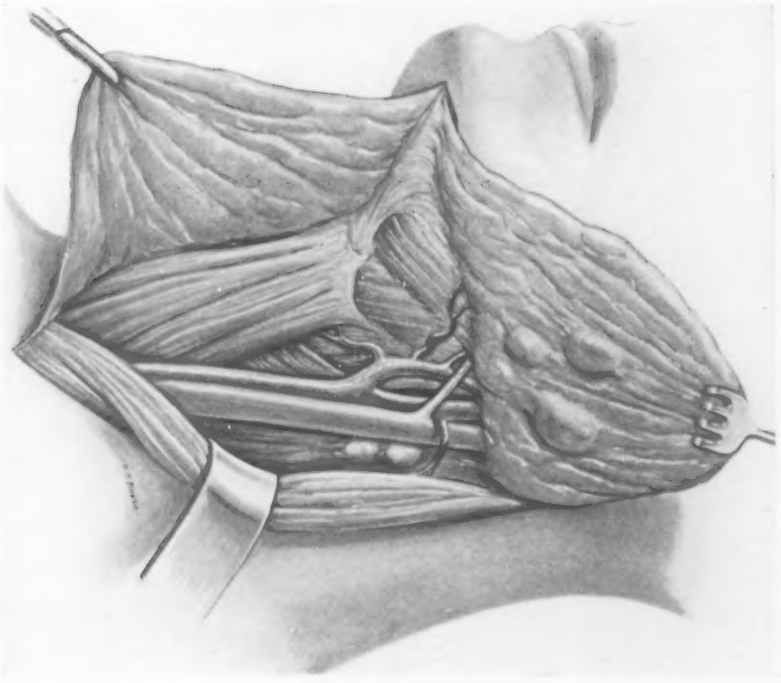

FIG. 3.—Neck as it appeared after removal of glands and cellular tissues.

working wide of all suspicious areas, remove every particle of tissue but the muscles and greater vessels and nerves. Occasionally it may be necessary to remove muscular tissue, resect a jugular, or even a larger artery as in a case of large carotid body tumor reported in 1917 * and who is well to-day. This procedure is not the laborious and time-consuming affair that is the usual conception, for by working well outside the limits of the disease we are in very normal tissues that dissect cleanly and freely.

Case Report.—Miss E. B., age sixty-one, was first seen by Dr. E. Foskett who referred her to Dr. A. P. Voislawsky for confirmation of diagnosis and treatment. She was sent to Dr. Robert Abbe by the latter for radium treatment. Three months before observation she noticed the enlargement of the tonsil, her attention being called to it by a feeling of fulness in the throat and slight difficulty in swallowing. It was but three weeks before she was seen that she noticed the glandular enlargement in the neck. The right tonsil was greatly enlarged, presenting a fungating appearance. The anterior cervical chain of glands were enlarged but apparently discrete and movable. It seemed that while the diagnosis was probably carcinoma that she would stand a better chance for cure wtih a thorough cleaning out of the neck and wide removal of tonsil with strong postoperative radiumization. She was referred to me for operation, January, 1920.

FIG. 4.—Patient three years after operation.

Operation, January 5, 1920.—A block dissection of the right side of the neck from the clavicle to the superior pharyngeal constrictor muscle beneath the tonsil was first done, including all tissue except the submaxillary and sublingual glands, muscles and greater vessels and nerves. The lymphatics beneath and behind the sterno-mastoid were removed as well but at examination this group was only hyperplastic. The tonsil was enucleated by going through the anterior pillar, which had become adherent as well as the posterior, and extending the dissection into the muscles and through the posterior pillar. The pharynx was not opened, to avoid a probable and disagreeable fistulous tract, and because it was believed that radium treatment would take care of any remaining disease in the

* ANNALS OF SURGERY, 1917, p. 252.

thin septum left. The patient left the hospital twelve days after operation and combined outside and inside radium treatment was begun, the patient receiving 540 mg. hours.

Pathologist Report.—Diagnosis, lymphosarcoma of tonsil with involvement of cervical nodes.

Macroscopic Examination.—The tonsil measures 3.3x3x2.5 cm. It is uniformly enlarged and the oral surface is ulcerated rather superficially. The color of the nodes normal but show a soft cellular structure, without any evidence of fibrosis. The capsule is intact posteriorly. There is a greatly enlarged soft cellular cervical node resembling in color and consistency the tonsil.

FIG. 5.—Patient three years after first operation and two years and four months after second operation.

Microscopical Examination.—Sections of tonsillar tumor show a very large cellular growth partially covered by a thin layer of squamous epithelium, but without the characteristic deep crypts of the normal tonsil. The normal markings are also obliterated by the cellular growth and germinal centres cannot be seen. The predominating type of cell is a large one with a rather large pale nucleus, much the type of those found in the germinal centres of lymph-nodes. There is no intervening stroma between the cells, but short hyaline fibrous trabeculæ are not infrequent. Small blood-vessels are found within these. Mitoses are fairly numerous. The muscular fibres in contact with the posterior surface of the growth have been considerably invaded, showing that the growth is not limited by a capsule. In these locations the muscle fibres are small and nearly atrophied. Sections of the large node show the same type of growth. Other smaller nodes show chronic inflammation without metastases. The growth appears to be a lymphosarcoma of the type originating in the lymphoid tissue and is evidently malignant judging from its invasive quality.

Six months after operation, this patient again felt the sensation of a lump in her throat but this time on the left side, and had gradually increasing difficulty in swallowing. She noted an enlargement of the left tonsil. Two months later (eight months after the operation) she presented herself with an exact counterpart of the original condition which had existed upon the right side. Cervical glands had been noticed three weeks before. The left tonsil was greatly enlarged

and showed the same cauliflower growth. Exactly the same operative procedure was carried out upon the left side, September 20, 1920, eight and one-half months following the first. The patient left the hospital fifteen days after the operation and again received radium treatment.

The second report of the pathologist is a duplicate of the first. Diagnosis, lymphosarcoma to tonsil and cervical nodes. Microscopical examination—sections of the tonsil show none of the normal follicular arrangement but a diffuse growth of rather large round cells somewhat resembling lymphocytes and occupying the position of a tonsil being still covered in some areas with stratified epithelium. There is only a very delicate stroma which carries the blood-vessels and the cells are arranged diffusely and form a very cellular tissue, the type of a lymphosarcoma. The smaller lymph-nodes show also the same type of growth as the nodal structures are obliterated in these also.

Whether we are to regard the reappearance of the disease in the left tonsil as a metastasis or as a recurrence, in the sense that Dr. Ellsworth Eliot† speaks of, is uncertain, but I decidedly incline to the belief that it was an independent occurrence of the disease in similar tissue due to the same unknown etiological or causative factor that produced the original, notwithstanding the very short interval that elapsed between the two appearances of the disease. The patient is a woman of exemplary habits and mode of life and there is nothing in her family or personal history suggestive as a causative factor in her disease. She is well to-day, her wounds both in neck and throat scarcely appreciable, and she appears in perfect health. No visceral involvement or other glandular enlargements have occurred at any time. Notwithstanding the extent of the surgical removal, I believe that radium played an important part in her recovery.

W. S. Schley, M.D.,
New York, N. Y.

ACUTE INTESTINAL OBSTRUCTION CAUSED BY CHRONIC ORGANIZING PERITONITIS OF UNDETERMINED ETIOLOGY

Editor Annals of Surgery:

Sir:

Dowd of New York has recently reported a case of acute intestinal obstruction due to extensive peritoneal adhesions. This so closely resembles a case we have recently seen and is apparently so uncommon that we believe it of sufficient interest to put on record.

Case Report.—Hospital number 248302. A. P., a white male, age twenty-two, a private in the C.A.C., U.S.A., was admitted to Ancon Hospital at 9.55 P.M., November 6, 1922, with the following letter from his medical officer. "This patient was first seen about 4.30 P.M. today. Complained of considerable pain in lower abdominal region. No rigidity, no tympanites, no nausea or vomiting, and no temperature. Was given hypo of ½ gr. morphia, dose of castor oil, and admitted to post hospital. No pain or tenderness over region of appendix. Seen again at 9.00 P.M., apparently in considerable pain, some nausea and vomiting, and

† Annals of Surgery, September, 1922.

considerable rigidity with some tympanites. Skin moist, pulse rapid, no elevation of temperature. Looks like an acute surgical abdomen."

The patient's statement on admission was that while on sentry duty about noon today he developed a colicky pain in his abdomen. This became worse and at 2.30 P.M. he fainted and was carried to the guard-house by his prisoners. He does not remember having had the diseases of childhood and emphatically denies any previous abdominal trouble. He was apparently in very severe pain in spite of his large dose of morphine and was rolling on the bed and crying when seen on admission.

Physical findings were as follows: His face showed his intense pain and the expression was one of anxiety. Vomiting was occurring practically continuously. His abdomen was markedly distended, rigid, and tender. His temperature was 97.2°F., pulse 60, small and easily compressible, and the skin moist and clammy. A provisional diagnosis of ruptured gastric or duodenal ulcer, or some type of acute obstruction was made and patient prepared for immediate operation.

Operation.—Ether anæsthesia. A long incision through the right rectus muscle was made, extending from the costal margin to well below the umbilicus. An increased amount of cloudy peritoneal fluid was noted and the incision was immediately filled with markedly distended congested small intestines, but were prevented from eviscerating by a mass of veil-like adhesions of varying density which completely involved both small and large gut. These adhesions seemed to bind the intestines into a mass, and at least ten or twelve areas were noted where complete obstruction had taken place. The large intestine was distended to the sigmoid flexure, the rectum was empty and practically collapsed. The adhesions seemed to be of increased density at the cæcum, the hepatic, splenic, and sigmoid flexures, while those involving the small intestines varied from thin veil-like adhesions of apparently recent origin that were easily separated with the fingers, to denser bands that required cutting with scissors and ligating. The appendix tip was adherent to a loop of small gut and at first sight suggested a fistulous tract opening into the intestine, but further investigation showed it to be only adherent. There was no evidence of acute inflammatory conditions, tubercles, or neoplasm. The mesenteric glands appeared enlarged and hard, and one was excised for examination. The appendix was removed for examination as to etiology.

Beginning at the ligament of Trietz, the entire small intestine was freed by cutting the adhesions with scissors. The denser adhesions around cæcum and flexures were cut and ligated as fairly large vessels were encountered. Finally an enterostomy was done in the mid-portion of the ileum where the most distention and intra-intestinal fluid was noted, a rubber tube inserted, and the intestine sutured to the peritoneum and abdominal wall. The entire operating time was one hour and fifty-six minutes; the pulse had remained between eighty and ninety per minute, and grave doubts were experienced that we had done the patient any great benefit on account of the probability of immediate recurrence of the adhesions.

Post-operative.—Patient was given 5 per cent. solution of glucose and soda bicarb., oz.vi every 3 hours by rectum, and morphia hypo as required for restlessness. He was allowed limewater on cracked ice by mouth as soon as he came out of his anæsthetic. Convalescence was stormy for the first five days on account of abdominal distention and vomiting. This was relieved by enemata, pituitrin and gastric lavage, and the drainage from the enterostomy tube became well established. On the third post-operative day he had a liquid stool by rectum. Daily enemata were used to stimulate intestinal peristalsis and to decrease the discharge from the enterostomy tube, which amounted to about oz.xx in twenty-

four hours This tube was removed on the eleventh day and the fecal discharge soon excoriated the skin in spite of the zinc oxide ointment used. This was further complicated by quite a profuse hemorrhage from the border of the enterostomy opening on the fourteenth day, but was readily controlled by packing. About this time he was put on a special soft diet, having been on liquids up to this time.

From this time his convalescence was satisfactory, his enterostomy discharge gradually decreased, his bowels moved naturally, and he was allowed up as soon as his strength permitted. After the thirty-seventh post-operative day the daily enema was discontinued and he was given cascara and senna mixture every evening. His bowels moved regularly, he regained all lost weight and had no further abdominal symptoms. The enterostomy wound closed without further operative measures and he was discharged from the hospital on January 10, 1923, sixty-five days after admission.

He has been seen twice following his discharge from the hospital, the first time following a thirty days hike into the interior of Panama, and appeared to be in perfect health and was entirely free from any symptoms relative to his previous condition. He reported by request on April 26, 1923, for examination. His wound was firmly healed without sinus or hernia. He stated his bowels were regular, and that he had no recurrence of symptoms, however slight, since leaving the hospital. He was at normal weight and doing full military duty.

The pathologist reported as follows: Appendix negative. Gland shows moderate amount hyperplasia of reticular tissue. No evidence of tuberculosis, syphilis or tumor. The Wassermann blood test was negative.

HOWARD K. TUTTLE, M.D.,
Ancon Hospital, Canal Zone.

DIET AFTER GASTRO-ENTEROSTOMY

EDITOR, ANNALS OF SURGERY:

Sir:

I note that in the Lancet, March 31, 1923, under the heading Treatment of Duodenal Ulcer, a distinguished surgeon in the menu which he gives to all his gastric and duodenal cases for their guidance after operation mentioned *"Meat Cooked a Second Time," "Boiled Milk," and "Brushing the Teeth, Gums and Inside of Cheeks"* a few times daily.

As to the first I have little to remark further than to state that I prefer meat "cooked to a turn," *i.e.*, juicy, tender fle h which dissolves in the mouth during mastication, I consider over-cooked meat, all the sap of which remains in the oven, on a par with cooked timber, absolutely useless as a food, and after long experience in this land of meat eating, I have been forced to the conclusion that it acts as a foreign body and as such is a fertile source of cancer of the stomach.

As to the second, I am a believer in the dictum *"Boil Milk and You Spoil Milk,"* and consequently order fresh milk when it can be obtained from a healthy cow. But if any doubt should exist as to the latter I recommend scalding. Always with primary scalding of the vessel in which it is about to be retained. In many adults there seems to be an extraordinary repugnance to milk—which boiling usually intensifies—a dislike which I can only explain

by the difficulty they find in digesting it. This may be alleviated by the addition of barley or mineral water and a few grains of citrate of soda. In suitable cases a teaspoonful of whiskey to each glass of milk is a helpful combination. I never permit milk to be taken with a meat meal.

As to the last quoted item, *viz.*, "*Brushing of Teeth, Gums and Cheeks*," I have no experience of "brushing" of the two last mentioned, but I have had an extended one of the brushing of teeth and, rightly or wrongly, have come to the conclusion that a large percentage of human suffering (*e.g.*, pyorrhœa, dental caries, gastric infection, appendicitis and organic decomposition in general) is caused by the inane daily scrubbing of teeth by bristles and by the insane use of chemical dentifrices, both of which lacerate and mortify living tissue, destroy epithelial defence and provide the entrance for hostile germs. I earnestly invite the attention of my readers to the handicap which this kind of thing imposes on natural disinfectants, saliva and mucus. I do not think that there is a human being to be found outside a mad-house who would advocate similar brushing, *etc.*, of the interior of the anal canal. If such a hygienic enthusiast can be discovered, and he makes a hobby of it, I am prepared to lay him a shade of odds that in nine instances out of ten the immediate result will be proctititis plus toxæmia, and that the ultimate one will be cancer.

In making above statements I do not wish it to be inferred that I disapprove of cleansing the teeth at bedtime, on the contrary, a *gentle cleansing* with a soft (badger hair) brush and some ordinary soda or other effervescing potable water is an unirritating and salutary procedure, and I can personally vouch as to its being an effective and agreeable one.

As to disinfection of the gums and buccal mucous membrane, I insist that the job appertains to the natural scavengers and that artificial meddling with their work is as insensate as it is destructive. *In Other Words do not Put Anything Into Your Mouth that You Would be Ashamed to Put Into Your Stomach.*.

JOHN O'CONOR,
Buenos Aires, Argentina.

OSTEOMYELITIS OF THE SPINE

EDITOR ANNALS OF SURGERY:
Sir:

A considerable number of cases of osteomyelitis of the spine have been reported, some as early as 1833. Donati (Archiv für klinische Chirurgie, 1906, vol. lxxix, p. 1110) reports fifty-five cases and one of his own. Plenz (Deutsche med. Woch., vol. xlvii, p. 416, April, 1921) could find records of sixty-two cases of acute osteomyelitis to which he added three cases. In somewhat more than half the cases the disease involves the vertebral body alone; sometimes only the neural arch is involved; sometimes both arch and body are affected. Osteomyelitis of the spinous process alone is unusual.

Such a case is herewith recorded. We have found no other case in a search of the literature.

Acute osteomyelitis of the spine, due most frequently to the staphylococcus, is a disease of youth. Most of the cases come in the period from the tenth to the twentieth year. However, a case of acute osteomyelitis has been recorded in a three weeks' infant. (J. Madier Nourissou, vol. x, p. 168, May, 1922.) Like Pott's disease it most frequently affects the most mobile part of the spine, the lumbar region. Twenty of Donati's fifty-six cases are lumbar. Trauma and infection elsewhere play a part in the etiology of the disease as in osteomyelitis generally. The mortality according to Whitman (Orthopedic Surg., 6th Ed., p. 114) is 56 per cent. Kyphosis does not follow recovery.

It is a disease of sudden onset, rapid abscess formation and great tenderness. The spinal canal may be invaded. Paralysis and death can occur without rupture of the dura as in Braunlich's case (J. A. M. A., vol. lxviii, p. 347, February, 1922). The abscess tends to point anteriorly where the body of the vertebra alone is affected, and posteriorly where the neural arch is concerned. Simple incision and drainage are demanded where the arch is involved. Laminectomy may be necessary where the disease is confined to the body. Occasionally more than one vertebra may be affected.

Katie Klimo, L. H., 90667, age ten, entered Lakeside Dispensary on June 13, 1922, with the complaint of lame back. The illness began a week previously when the patient fell on the school steps, striking her back. There was little pain or disability and the patient continued at school for two days. Two days before admission she became feverish and complained of great pain in the lower back, so that she could not walk or stand and cried with pain when moved in bed. Examined in the dispensary her temperature was found to be 38.6° C. There was marked tenderness in the mid-lumbar region with spasm of the lumbar muscles. Motion was not permitted. There was no swelling and no fluctuation, but a little heat. This, together with the elevation of temperature, seemed to rule out a simple sprain or fracture. The process was too acute for Pott's disease. The diagnosis of osteomyelitis of the spine was made and the patient was sent into the hospital. X-rays of the spine were negative. The patient ran a septic temperature with little change in the condition of the back. On June 22nd the temperature rose to 40 degrees C. On that day an incision was made over the spinous processes in the mid-lumbar region. A pocket containing several ounces of pus was encountered and evacuated. The spinous process of the third lumbar vertebra was rough and without periosteum. The incision continued to drain. On the 30th the incision was enlarged and the spinous process of the third lumbar vertebra removed. The rest of the vertebra and the adjoining vertebræ seemed normal. The incision gradually closed. The patient was discharged well on July 16th.

The patient was seen January 27, 1923. The incision was healed. There was no tenderness. The back motions were normal. X-ray showed no regeneration of the spinous process that had been removed.

GEORGE I. BAUMAN, M.D.,
RICHARD E. STIFEL, M.D.,
Cleveland, Ohio.

THE QUESTION OF DRAINAGE IN INTRA-ABDOMINAL INFECTION

EDITOR, ANNALS OF SURGERY:

Sir:

In the May, 1923, issue of ANNALS OF SURGERY, there appears an article by Wilensky and Berg on "A method for determining the question of drainage in intra-abdominal infection." They quote no previous workers along this line of study. I feel sure they would be interested in an article written in 1912 by Wilkie of Edinburgh (*International Clinics*, 22, vol. iv, pp. 145-153), in which this subject receives rather thorough attention.

Wilkie's subject was "The prognostic value of an immediate examination of peritonitic exudates," and rather early in the discussion he makes this statement: "* * * The film can usually be stained and examined long before the surgeon has completed his work, so that he may also have the benefit of such accurate information as it affords in deciding the question of drainage."

The article is beautifully illustrated with color drawings of the various typical fields in fatal and non-fatal cases, as determined by the type and number of bacteria present and the degree of phagocytosis. In other words, Wilkie goes deeper into the problem than do Wilensky and Berg, and in speaking of phagocytosis as revealed in the stained film, he says "* * * the important point for the surgeon and patient is not the name and cultural characters of the invading germ, but its relative virulence for the particular individual."

There was a revival of wound-study by means of smears during the recent war, and I have personally availed myself of every opportunity to study wounds by Wilkie's method since reading his article.

Within the past year, my colleague Doctor Voeglin and I have presented the results of a study of wounds in general, in an article in *International Clinics*, 32, No. iv, pp. 281–295. I am thoroughly in accord with Doctors Wilensky and Berg in their endeavor to popularize a method which has proven valuable because of its simplicity, the type of information it conveys to the surgeon, and the speed with which the information is forthcoming.

It is to be hoped that in the studies which Wilensky and Berg are continuing, some note will be made of the degree of phagocytosis, etc., in order that their next report will either confirm or refute the theories of Wilkie and others in this field of study.

EDWARD P. HELLER, M.D.,
Kansas City, Mo.

BOOK REVIEWS

LAWSON TAIT, HIS LIFE AND WORK. By W. J. STEWART MCKAY. 8vo, pp. 579. New York, William Wood and Company, 1922.

Lawson Tait died in June, 1899. Most of his contemporaries, with so many of whom he waged acute controversy almost up to the day of his death, have already followed him to the grave. Among the new generation, which now occupies the stage of action, his name remains as that of a leader and a pioneer in regions of surgery which since his time have become among the most common fields of surgical endeavor, and out of which some of the greatest rewards of such endeavor are constantly being secured by every surgeon. He had a rare personality, an intense conviction of the truth of the conclusions to which his observation and reasoning had led him, and a vigorous and defiant readiness to override any opposition he might meet in the advocacy of his views. His two bêtes noir were Mr. Lister and Mr. Spencer Wells. This hostility was as much temperamental as it was scientific in origin, for one cannot imagine a greater difference in personality than that which distinguished these eminent contemporaries from the impatient bellicose master surgeon of Birmingham. The manner in which Lister did his work was entirely the opposite of anything that Tait could conceive or undertake. But both did a great work, although that of Lister was of far the greatest fundamental importance, and furnished the basis upon which the teachings and methods of Tait were elaborated and perfected by others until they became the common property of humanity.

Doctor McKay has performed a good work in preparing this record of the life and work of his old master. Those surgeons who knew Tait and still remain will welcome the book, bringing back to them the memories of issues and controversies of their younger days, which they now look back upon with interest and tolerance and a juster appreciation of respective merits than was possible in that former day. To the surgeon of the twentieth century it will introduce one of the most picturesque figures of the surgical world of the nineteenth century, in whose career much of instruction may be found, and to whose character and merits and achievements lasting honor should be given.

By 1884, Lawson Tait had reached the climax of his fame and his influence, although he had not reached the fortieth year of his age. He was only fifty-four when he died. It was my own good fortune to get a good view of his personality at that time. Spending some time in London in March of 1884, I wrote him asking the privilege of going to Birmingham and seeing his work. A day or two later, at my lodging in Craven Street, near the Strand, late in the evening, after I had begun to get ready for bed for the night I was summoned to the entry hall below by word that a gentleman was

waiting there to see me. My visitor announced himself as Lawson Tait! I had that very morning received a note from him in reply to my letter informing me that he was shortly to be in London to operate and that with the permission of the physician whose patient it was that he was to operate upon, he would like to have me present. Now he had followed his letter by this personal call at that late hour to apprise me of the place and hour the next day when the operation was to take place! Such a personal midnight visit to an entire stranger was a fair example of the impetuosity and directness of his character. The following week I was his guest in Birmingham. The "close up" view which I now had of Mr. Tait increased greatly my appreciation of his talents and my admiration of his work. The photograph shown in Plate IV of McKay's book represents perfectly the Lawson Tait of that day, Tait at his best. I have the same autographed photograph which was given me by Tait when I bade him good-by in 1884. I did not see him again until 1892, when we both were in attendance at the meeting of the British Medical Association of that year. Then the effects of the disease that had begun to sap his vitality were already evident. We could wish that the earlier photograph which more truly represents the real man had been chosen for the frontispiece of this book rather than the one which has been placed there which is the one that was published in the Medical Journals at the time of his death, and which presents his visage in his closing years as altered by disease and prolonged suffering. Tait was most cordial in his reception of his American colleague. They were of the same age, and the evident appreciation and admiration shown by his trans-Atlantic visitor was not disagreeable to the Birmingham surgeon. Over the "walnuts and wine" he spoke freely of many things. Tait was a great admirer of his old Edinburgh teachers, Syme and Simpson, and most appreciative in his expressions as to the work of Marion Sims (he dedicated his work on Diseases of the Ovaries to Sims). He referred also in terms of deep indignation to the conduct of certain visiting surgeons who had come to him and, after having been shown every courtesy, had been guilty, after their return home, of publishing unfounded criticisms and erroneous statements as to his own personality and methods. To a surgeon like myself who had known what the surgery of the pelvis had been before Tait had fished out the Fallopian tubes from the Serbian bog of pelvic cellulitis and parametritis in which they had been concealed up to his time, the importance and the originality of his teachings were clearly apparent. I fully agree with the statement of his biographer (p. 135) that "if we were to single out the one subject upon which Tait's future permanent fame will rest, we would not hesitate for a moment in selecting his original work in establishing the surgery of the Fallopian tubes as the greatest achievement of his life. Nothing that he ever did gave rise to so much criticism and opposition. Even the very existence of diseased appendages was denied, and his opponents did not hesitate to use terms about Tait which left their hearers in no doubt that they looked upon the provincial surgeon as nothing more

than a liar." Pelvic surgery has travelled a long way since Tait removed his first pyosalpinx in 1879 and met with such open skepticism as to his work.

The surgeon of the present day who undertakes pelvic surgery with its problems so fully worked out and its methods of treatment so fully established and its record of successful achievement so long and encouraging, ought not to forget who was the pilot that first led the way into the field of endeavor into which so many now fearlessly crowd.

After 1890, the original work of Tait may be said to have come to an end. His energy was largely exhausted in the effort to cope with the advancing kidney disease which had fastened upon him. He made no new discoveries; he dropped out of public view, and he found a retreat in his country home, although he still came up weekly to Birmingham for consultation and to operate. From time to time he contributed brief articles and letters to medical journals, largely controversial in character. One of his last contributions was a reply to a colleague on the mortality of operations on pus tubes! At three o'clock on the afternoon of June 13, 1899, he died at his home.

Mr. McKay has brought to his task as biographer both enthusiasm and knowledge. He was Mr. Tait's assistant in 1891, when the latter was still actively at work. He has given us in this book an exceedingly interesting and instructive story of a great but eccentric man. It is an account that will endure. It should be read by every surgeon who is interested in the history of his science and in the personality of the men who have made it what it is.

LEWIS S. PILCHER.

THE FORM AND FUNCTIONS OF THE CENTRAL NERVOUS SYSTEM, by FREDERICK TILNEY, M.D., Ph.D, and HENRY A. RILEY, A.M., M.D., New York, 1923. Paul B. Hoeber.

A new edition of this treatise in two years indicates the appreciation of high scientific work in this country. Merely corrective changes appear, with no increase in bulk.

The aim of the authors, to apply the accumulated knowledge af anatomy, morphology and function to the problems of practice and the interpretation of morbidity, is carried out with a thoroughness that evokes admiration. The book has already attained the position of an authoritative American text.

It has many features of interest. In conception and scope there is much of novelty. Its size, pp. 1019 royal octavo, permits adequate handling of the subject. The concise summarizing of syndromes, a modern development in typing disease, makes the volume doubly valuable to any physician for reference. Diagrams, cuts and colored figures are admirably illustrative. And a useful glossary is appended. The book is so infused with technical terms and latest isms, that it should be a source of delight to the neophyte no less than to the scholar and worker.

As it is not primarily a system of nervous diseases such diffuse conditions

as meningitis, encephalitis, hydrocephalus, Korsakoff's syndrome, etc., evidently are not available in applying its teachings.

The inevitable slips, lapses and limitations are more interesting than important. A couple may be mentioned.

It seems impossible to carry out such a comprehensive handling of a large field without many duplications of statement. While this may serve to integrate, it considerably expands that which needs no padding. And if scissors-secretarial work happens to be included, there is a tendency to overlap rather than harmonize material.

A nominal inconsistency, that might bear elucidation, appears in reference to athetosis. On p. 815, "The dominance of the neokinetic system becomes defective" and "the infant thus affected soon presents a voluntary paralysis." Yet in a case of double athetosis, from a lesion beginning in early life, there is noted, p. 824. "The absence of any signs referable to the neokinetic system" and "the absence of paralysis or any evidence of involvement of the pyramidal system."

Consciousness and its disturbances, aside from self-consciousness, appear to be dismissed, p. 905, with the remark that "It is of little profit to rehearse the many theories of consciousness and its origin." This may be true, but it does not apply to consciousness as an objective reality or to the study of its clinical significance. For this purpose many facts are clear and admit of intelligible statement. Such terms in common use, as coma, narcolepsy, lethargia and even sleep, show that consciousness and its modifications are matters of large clinical importance. In reality neurologists make good use of these in both general localization and differential diagnosis.

No account is taken of the central canal of the cord, beyond a simple mention, nor of the work of Kramer of Cincinnati, in showing the frequency with which it opens below and its importance in such cases to surgical procedures or possibly to infections.

In a book of facts the inclusion of many probable functions and relations is a trifle disconcerting, especially as in the past so many such have gone to the discard. Or, *e.g.*, "the primitive emotion of parental feeling, probably arising first in the thalamus." The work of Mills indicates that this applies only to the right thalamus or its vicinity (in the right-handed).

It is doubtless too much to expect great accuracy or detail regarding the local circulation. And as no attempt is made to apply this part by cases, it is not clear what advantage was to be expected from including it.

Any slight blemishes, however, may serve, like "fascinators" on a girl's complexion, to bring out its quality. For clearness of expression, roundness of diction and logical consecutiveness the work can long be held as a guidon. Few have the qualifications to handle all the phases included, and still fewer the requisite energy. It is massive in every way. And the publisher's side is done with equal elegance.

WILLIAM BROWNING.

ENLARGEMENT OF THE PROSTRATE. By JOHN B. DEAVER, M.D., LL.D., Philadelphia, 1922. P. Blakiston's Son & Co.

It is of interest to note that the author since the publication of the first edition of his work on this subject has materially changed his viewpoint as to the treatment of prostatics, and now advises prostatectomy as a primary rather than a secondary resort, feeling as has long been contended by others that it is by far safer for the patient than the employment of any palliative measures.

The technic of prostatectomy has indeed became so exact that the operative risk has been relegated to a position of much less importance than formerly, and stress has been properly placed upon the pre- and post-operative treatment. Statistical studies are quoted showing the effect upon the prognosis which proper preparation and care has upon these cases.

The most important question and possibly the most difficult to properly convey to the reader is that dealing with the proper time to remove the gland after preliminary drainage. Indeed it is in many instances only to be determined by personal judgment rather than by absolute laboratory test. The author tends to be guided by the patient's general condition rather than by the phthalein determination, although the increased seriousness of a falling output and a rising blood urea is fully taken into consideration.

The chapters on diagnosis, prognosis and the treatment of complications are most instructive and may be thoroughly studied with much benefit; all the essential tests and their relative value are definitely stated.

An exhaustive resumé of the various operative procedures employed is given, including the technic of suprapubic prostatectomy as advocated by Pilcher, Judd and Squier, while the perineal route as done by Proust and Young is given ample space. All methods are excellently illustrated, as indeed are all phases germane to the text throughout the book.

JAMES T. PILCHER.

TREATMENT OF FRACTURES. Reports of the Committee on Fractures of the American Surgical Association for 1913, 1914, 1915, 1916, 1917, 1918, 1921. Edited by J. F. BINNIE, M.D., and JOHN H. JOPSON, M.D., Recorders of the Association, and JOHN B. ROBERTS, M.D., and WILLIAM L. ESTES, M.D., Chairman of the Committee. Published by the Association, 1922.

The appointment of a special committee of the American Surgical Association in 1912, for the study of fractures, was an outgrowth of the revival of interest in this subject to which a number of factors contributed. Among the most important of these was the work of Sir W. Arbuthnot Lane, who was largely responsible for the introduction of what might be properly styled the "operative era" in fracture surgery. Lane's visit to the United States in 1909, Harte's Presidential Address before the Association in 1911, and a symposium on fractures in 1912, led up to the appointment of the Committee on Fractures in 1912. This committee, with slight change in personnel, continued its investigations until 1921, when the final reports were received.

These reports, tabulated along certain lines, with special chapters by individual members of the committee on regional injuries, and a chapter on fractures in war, are gathered together in the volume under consideration. During the period mentioned, the committee broadened its investigation as the study of fractures progressed. The original resolution of the Association charged it with the task of preparing a statement as to the relative value of the operative and non-operative treatment of fractures of the long bones (closed and open), along with a formulation of opinion of the value of radiography as a means of determining the choice of method of treatment. Its first report was therefore directed toward these aspects of the subject. Other subjects subsequently included were on the legal responsibility which the use of the X-ray involved, the fixing of standards for determining the length of disability which might be expected after fracture of the various bones, the percentage of total disability in different fractures, the relative value of certain special forms of non-operative treatment, the treatment of compound fractures, and the most favorable times for operative intervention. The irregular and oftentimes incomplete methods of recording salient points in the case histories studied, led to the preparation of a special form for the recording of histories of fracture cases. This form has been adopted by the Association, recognized by the American College of Surgeons, and adopted by many hospitals throughout the country.

The original committee consisted of Dr. John B. Roberts, Chairman; Drs. W. L. Estes, Thomas W. Huntington, Edward Martin and John B. Walker. Doctor Roberts resigned from the committee in 1915, Doctor Estes became Chairman, and Dr. A. P. C. Ashhurst became a member. The tabulation of results is based on more than 2000 cases of fracture in civil life, and over 6000 cases in military practice. The latter group are the subject of a special chapter by Dr. J. B. Walker.

During the eleven years which have elapsed since this committee began its work, the interest of surgeons generally in this special field of traumatic surgery has increased rather than waned. The great importance of the subject, in view of the general adoption of Workmen's Compensation laws, has been a contributing factor. The quickening interest of war, always a stimulant to progress in acute surgery, has had a great influence. The introduction of new methods of treatment and the revival of old and forgotten methods during the long period of strife, has led to a revision of opinions which had, under Lane's influence, become fairly fixed. It was fortunate that the committee did not conclude its work until these new methods had been at least in part evaluated. We are in a position today to contrast our present results with those of fifteen years ago, and this report will be welcomed by surgeons generally who are called upon to supervise fracture services, and to direct the treatment of fractures.

It is the fashion of the day to dwell upon standardization. To many this emphasis has become distasteful. Individual preferences in the line of treat-

ment are often based upon a habit of mind and practice, an unusual experience, or a peculiar skill, and are amply warranted. There are certain broad underlying principles, however, which should be familiar to all. A study of many cases and the conclusions founded upon such a study by a group of men of broad experience, such as constituted this committee, forms a solid foundation on which the individual surgeon may build as his experience and peculiar qualifications justify. LEWIS S. PILCHER.

ORTHOPEDIC SURGERY. JONES AND LOVETT. William Wood Co., New York, 1923.

The eminence of the authors, is sufficient to assure the masterly treatment of orthopedic surgery, a subject which has been the life work of both. This surgical treatise of 681 pages, takes up the affections of joints; the affections of bones (including malunited and ununited fractures); disturbances of the neuro-muscular mechanism; congenital deformities; static and other acquired deformities, together with details of apparatus.

The varied subjects, under these several headings, are considered in a methodical manner and many are prefaced with excellent notes on the surgical anatomy of the parts to be considered. The volume is replete with illustrations, each of which is well chosen. The descriptions of operative procedures are comprehensive, and an attractive feature of this work is the apparent care used in appending bibliography, making it easy for the student who desires further details, to consult the source.

The literary style is commendable, and the text, for a first edition, is remarkably free from typographical errors. Throughout the work, constant reference is made to basic principles and yet due emphasis is given to important details. The authors frankly admit, in the preface, that no attempt would be made to make the work encyclopedic but the reviewer is impressed with the mass of subject matter which surely cannot be found in any other text-book, at least in the English language.

This book contains an infinite amount of knowledge, for which every physician has a constant need. The general surgeon will find it invaluable and the orthopedic surgeon may well consider it a fitting tribute to his specialty from two individuals whose efforts have done so much to advance this branch of medical science.

DONALD E. MCKENNA.

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